SOIL SURVEY OF

Anderson County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1958–1968. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1970. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Anderson-Houston and Trinity-Neches Soil and Water Conservation Districts.

HOW TO USE THIS SOIL SURVEY

THIS SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in determining the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Anderson County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit, the woodland group, the pasture and hay group, and the woodland grazing group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green; those that have a moderate limitation can be colored yellow; and those that have a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the descriptions of the capability units, the pasture and hay groups, and the woodland groups.

Foresters and others can refer to the section, "Use of the Soils for Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Soils and Engineering."

Engineers and builders can find, under "Soils and Engineering," tables that contain estimates of soil properties and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Anderson County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county at the beginning of the publication.

Cover: **Coastal bermudagrass on Trawick fine sandy loam. This area was pine-hardwood forest.**

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Issued November 1975

SOIL SURVEY OF ANDERSON COUNTY, TEXAS

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

ANDERSON COUNTY is in the eastern part of Texas (fig. 1). It has a total area of 687,360 acres, or 1,074 square miles. Palestine is the county seat.

This county is partly in the East Texas Timberlands of the Southern Coastal Plains and partly in the Texas Claypan area. About 66,000 acres in the western part of the county is in the Claypan area. The soils in this part are used mainly for pasture. The soils in the East Texas Timberlands are used mostly for pasture and woodland.

Livestock and timber are of foremost importance. About 200,000 acres of open land and about 127,000 acres of forest land are grazed. About 200,000 acres is in commercial timber. About 86,000 acres is cultivated; of this, about 23,000 is in row crops, and the rest is in close-grown crops or hay or is not planted. About 28,000 acres is urban land.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Anderson County, where they are located, and how they can be used. The soil scientists went into the county knowing they would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Most soil series are named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Alto and Lufkin, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Elrose fine sandy loam, 1 to 3 percent slopes, is one of several phases within the Elrose series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

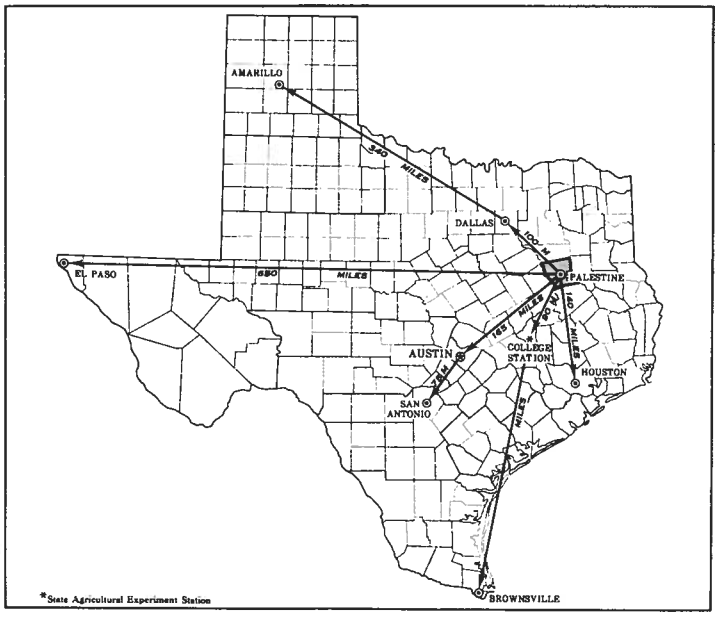

Figure 1.—**Location of Anderson County in Texas.**

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of Anderson County: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Freestone-Lufkin complex is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Kirvin-Sacul association, sloping, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Nahatche and Wehadkee soils is an example.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Anderson County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different proportion and pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is useful as a general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The six soil associations in Anderson County are described in this section.

1. *Fuquay-Kirvin-Darco association*

Deep, sandy and loamy, nearly level to moderately steep soils on uplands

This association consists of nearly level to moderately steep soils. It makes up about 47 percent of the county. It is about 26 percent Fuquay soils, 21 percent Kirvin soils, and 11 percent Darco soils (fig. 2). The remaining 42 percent is mostly less extensive areas of Bowie, Kullit, Robinsonville, Sacul, Susquehanna, Tenaha, Thenas, and Trep soils.

Fuquay soils are nearly level to sloping. They have a grayish-brown, neutral loamy fine sand surface layer about 8 inches thick. Below this is 22 inches of light yellowish-brown, neutral loamy fine sand, 20 inches of yellowish-brown, very strongly acid sandy clay loam, and 44 inches of very strongly acid sandy clay loam that is mottled in shades of red, brown, yellow, and gray. Below 94 inches and extending to a depth of 106 inches is weakly consolidated red sandy clay loam and light-gray clay mottled with strong brown.

Kirvin soils are gently sloping to moderately steep. They have a surface layer of medium acid fine sandy loam, about 12 inches thick, that is grayish brown in the upper part and pale brown in the lower part. The next layer extends to a depth of 50 inches and is strongly acid. The upper part is yellowish-red clay; the middle part is mottled clay loam; and the lower part is strong-brown clay loam that is mottled in shades of red and brown. The underlying material is stratified light-gray, yellowish-red, red, and strong-brown clay loam and loam that extends to a depth of 60 inches.

Darco soils are gently sloping to moderately steep. They have a surface layer of fine sand 49 inches thick. It is brown and slightly acid in the upper part and yellowish brown in the lower part. The next layer is red, very strongly acid sandy clay loam that extends to a depth of 67 inches. Below this is red, very strongly acid sandy loam that extends to a depth of 80 inches.

Most of this association is wooded and is grazed. Nearly all of the acreage that once was cultivated has been planted to improved grasses and is now used for pasture. Scattered small fields of truck crops and crops that provide temporary grazing make up part of the association. Much of the southern and eastern parts is in pine-hardwood timber. Deer and small animals ordinarily use this association as habitat.

The hazard of erosion is moderate to severe. Most areas of the soils are well suited as sites for housing.

2. *Darco association*

Deep, sandy, gently sloping to moderately steep soils on uplands

This association consists of gently sloping to moderately steep soils that are dissected by deeply cut drainageways. It makes up about 18 percent of the county. Darco soils make up about 53 percent of the as-

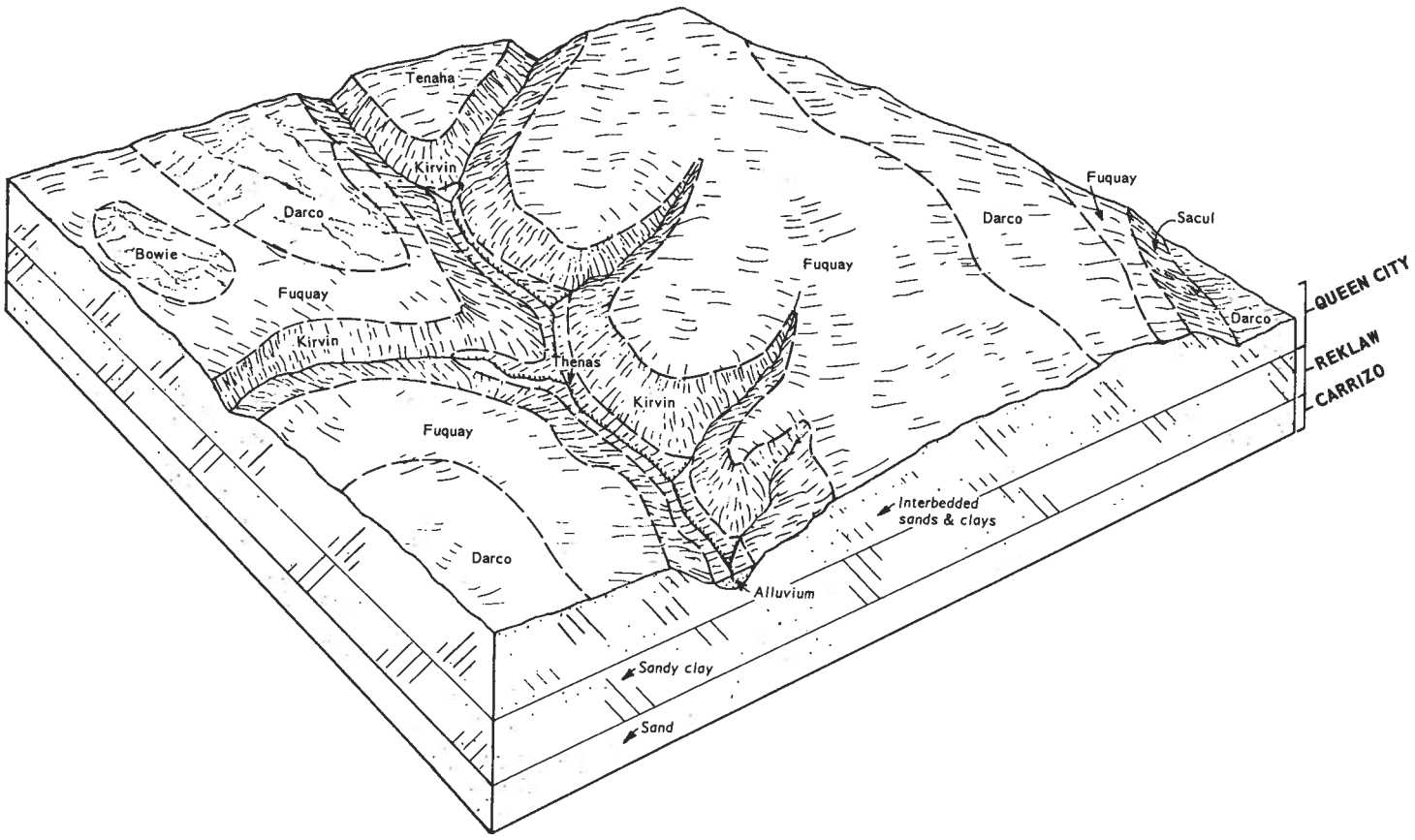

***Figure 2.*—Typical pattern of soils and underlying material in the Fuquay-Kirvin-Darco association.**

sociation. The remaining 47 percent is less extensive areas of Arenosa, Chipley, Eustis, Fuquay, Kirvin, Larue, Leefield, Pelham, Sacul, and Thenas soils.

Darco soils have a surface layer of fine sand about 49 inches thick. It is brown and slightly acid in the upper part and yellowish brown and medium acid in the lower part. The next layer is red, very strongly acid sandy clay loam that extends to a depth of 67 inches. Below this is red, very strongly acid sandy loam that extends to a depth of 80 inches.

Most of this association is wooded. About 15 percent of it has been cleared for cultivation but is now used for pasture. The remaining 85 percent is in pine-hardwood forest. This association is a good habitat for wildlife and is well suited to adapted pasture grasses and timber. Most areas are well suited as sites for housing.

3. *Trawick-Elrose-Bub association*

Deep to shallow, loamy, gently sloping to moderately steep soils on uplands

This association consists of gently sloping to moderately steep soils. It makes up about 14 percent of the county (fig. 3). Trawick soils make up about 40 percent of the association, Elrose soils 25 percent, and Bub soils 10 percent. The remaining 25 percent is less extensive areas of Alto, Darco, Fuquay, Hannahatchee, and Larue soils.

Trawick soils are gently sloping to moderately steep. They have a surface layer of dark-red, slightly acid fine sandy loam about 5 inches thick. The next layer is about 28 inches of dark-red, medium acid clay that is mottled in the lower part in shades of yellow and red. The next layer is 13 inches of strong-brown, medium acid clay that is mottled in shades of red and yellow. Below this is 5 inches of clay loam that is mottled in shades of yellow, brown, and red. The underlying material is glauconite that extends to a depth of 59 inches.

Elrose soils are gently sloping to strongly sloping. They have a surface layer of fine sandy loam about 10 inches thick. It is reddish brown and strongly acid in the upper part and yellowish red and slightly acid in the lower part. The next layer is 20 inches of red sandy clay loam that is medium acid in the upper part and strongly acid in the lower part. The next lower layer is 38 inches of strongly acid sandy clay loam that is dark red in the upper part and red in the lower part. Below this is 7 inches of red, strongly acid sandy loam. The underlying material is red, very strongly acid loamy fine sand that extends to a depth of 90 inches.

Bub soils are gently sloping to moderately steep. They have a surface layer of dark reddish-brown, slightly acid gravelly clay loam 4 inches thick. The next layer is 14 inches of slightly acid clay that is red in the upper part and yellowish red in the lower part. The underlying material is brown, partly weathered glauconite that extends to a depth of 28 inches.

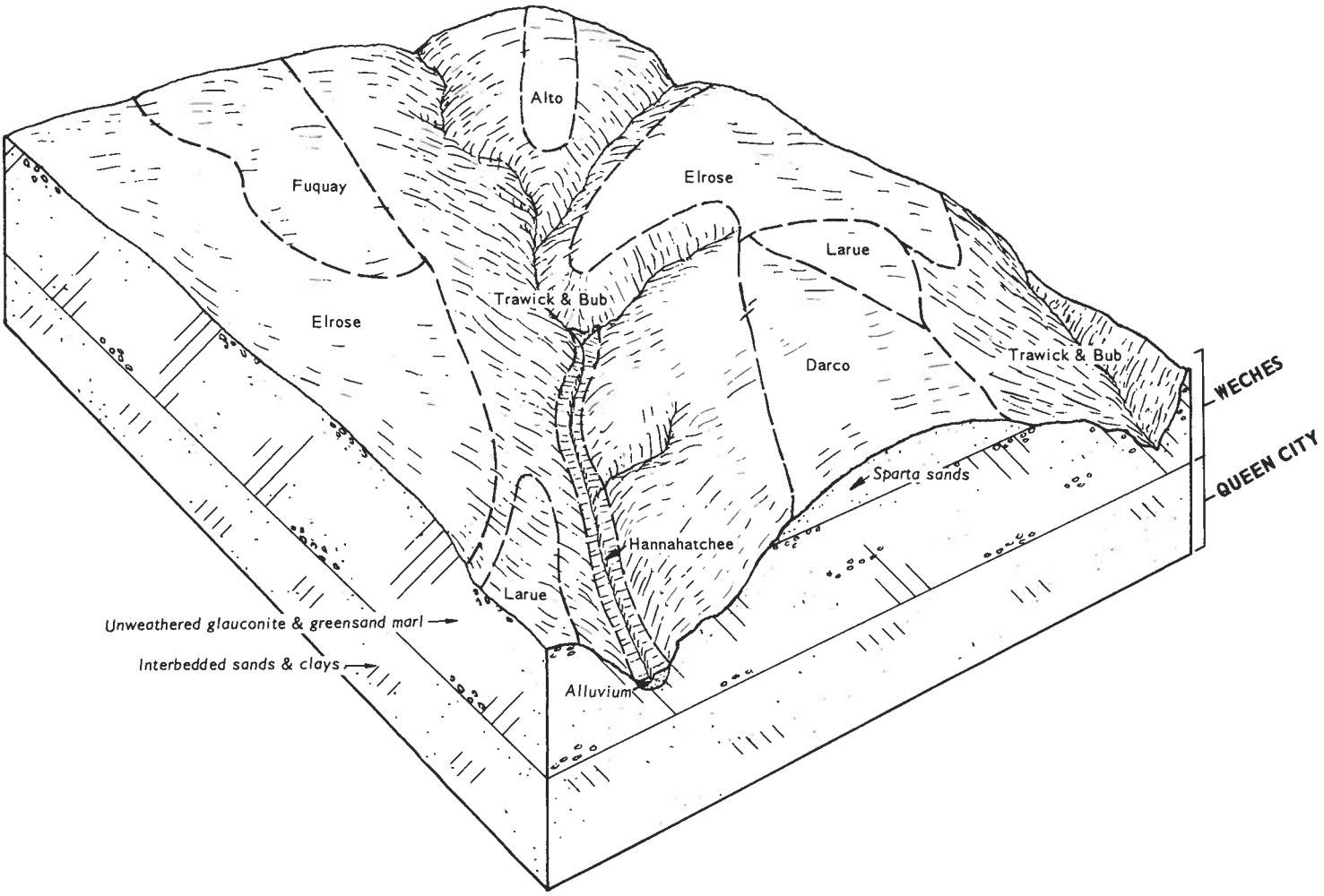

***Figure 3.*—Typical pattern of soils and underlying material in the Trawick-Elrose-Bub association.**

Most of this association has been cleared for cultivation but is now used for pasture. About 25 percent is in mixed pine-hardwood forest. A few small fields are cultivated to truck crops. The deeper, less sloping soils of the association are well suited to both row crops and pasture. The hazard of erosion is moderate to severe. Most areas of the soils are suited as sites for housing.

4. Axtell-Lufkin-Stidham association

Deep, loamy to sandy, nearly level to strongly sloping soils on uplands

This association consists of nearly level to strongly sloping soils. It makes up about 8 percent of the county. Axtell soils make up about 31 percent of the association, Lufkin soils 10 percent, and Stidham soils 9 percent. The remaining 50 percent is less extensive areas of Bernaldo, Burleson, Dougherty, Ferris, Freestone, Galey, Garner, Heiden, Kenney, Konawa, Nimrod, Normangee, Wilson, and Wrightsville soils.

Axtell soils are nearly level to strongly sloping and are on interstream divides and on the sides of drainageways. They have a surface layer of pale-brown, slightly acid fine sandy loam about 6 inches thick. The next layer is clay that extends to a depth of 66 inches. The upper 6 inches of this layer is strongly acid and is yellowish red mottled in shades of yellow and brown; the middle 36 inches is very strongly acid to medium acid and is mottled in shades of red, yellow, gray, and brown; and the lower 18 inches is moderately alkaline and is light olive brown mottled with brown. The underlying material is moderately alkaline and light yellowish-brown clay that is mottled in yellow and extends to a depth of 82 inches.

Lufkin soils are nearly level. They have a surface layer of strongly acid fine sandy loam 7 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The next layer, about 31 inches thick, is strongly acid clay that is mottled in shades of brown and yellow. It is dark grayish brown in the upper part and grayish brown in the lower part. Below this is gray, slightly acid to mildly alkaline sandy clay that is mottled in shades of yellow and brown and extends to a depth of 64 inches.

Stidham soils are gently sloping and are on terraces. They have a medium acid loamy fine sand surface layer about 26 inches thick. It is brown in the upper part and yellowish brown in the lower part. The lower layers extend to a depth of 72 inches. They are yellowish-

brown strongly acid sandy clay loam that is mottled in shades of red and gray.

Most of this association has been cleared and cultivated in the past, but now it is used mainly for pasture. Most areas are poorly suited as sites for housing.

5. *Kaufman-Trinity association*

Deep, clayey, nearly level soils on bottom lands

This association consists of nearly level soils on the flood plain of the Trinity River. It makes up about 8 percent of the county. Kaufman soils make up about 57 percent of the association and Trinity soils about 27 percent. The remaining 16 percent is overwash areas on deltas near the mouth of small streams and river channels.

Kaufman soils are in the more poorly drained areas of the flood plain. They have a surface layer of black, mildly alkaline clay about 38 inches thick. Below this is very dark gray, alkaline clay that extends to a depth of 72 inches.

Trinity soils are in slightly higher areas than the Kaufman soils. They have a surface layer of black, calcareous clay 30 inches thick. The next layer is very dark gray, calcareous clay that extends to a depth of 66 inches. Below this is dark grayish-brown, calcareous clay that extends to a depth of 75 inches.

Most of this association is in hardwood forest and is used for grazing. Some areas that once were cultivated now are established pastures. A few areas are used for crops. The soils of this association are subject to flooding and are better suited to pasture, wildlife, or hardwood timber production than to most other uses. They are poorly suited as sites for housing.

6. *Nahatche-Wehadkee association*

Deep, loamy, nearly level soils on bottom lands

This association consists of nearly level soils on flood plains. It makes up about 5 percent of the county. Nahatche soils make up about 70 percent of the association and Wehadkee soils about 20 percent. The remaining 10 percent is Thenas soils in better drained areas and Robinsonville soils on slightly higher ridges on the flood plain.

Nahatche soils have a surface layer of brown, medium acid clay loam about 8 inches thick. The next layer is medium acid, mottled dark grayish-brown clay loam about 11 inches thick. The next layer extends to a depth of 49 inches. It is light brownish-gray, medium acid loam and clay loam that is mottled. Below this is 10 inches of gray and strong-brown, medium acid sandy clay loam. Below this, and extending to a depth of 83 inches, is dark-gray, slightly acid clay loam that is mottled in shades of brown and yellow.

Wehadkee soils have a surface layer of grayish-brown, strongly acid, mottled sandy clay loam 10 inches thick. The next 18 inches is light brownish-gray, mottled, strongly acid sandy clay loam. The next layer extends to a depth of 58 inches. It is grayish-brown, very strongly acid sandy clay loam that is mottled in shades of brown, gray, and red. The underlying material is weakly stratified clay loam and sandy clay loam that extends to a depth of 72 inches.

Most of this association is in hardwood forest and is used for timber production and grazing. All the soils of this association are flooded at least once each year and are unsuited to cultivation. They also are poorly suited as sites for housing.

Descriptions of the Soils

This section describes the soil series and mapping units in Anderson County. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of each series description is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent in the name of the mapping unit. Unless it is otherwise stated, the colors given in the descriptions are those of a moist soil. Coarse fragments are reported as a percentage of the total volume of the soil material.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit, the pasture and hay group, the woodland group, and the grazing group to which the mapping unit has been assigned. The page for the description of each capability unit and each of those groups can be found by referring to the "Guide to Mapping Units" at the back of this publication.

The acreage and proportionate extent of each mapping unit are given in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*7*).[1]

A given soil series in this county may be identified by a different name in a recently published soil survey of an adjacent county. Such differences in name result from changes in the concepts of soil classification that have occurred since publication. The characteristics of the soil series described in this county are considered to be within the range defined for that series. In those instances where a soil series has one or more features outside the defined range, the differences are explained.

[1] Italic numbers in parentheses refer to Literature Cited, page 89.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Alto fine sandy loam, 1 to 3 percent slopes	2,580	0.4	Kenney loamy fine sand, 1 to 5 percent slopes	4,320	0.6
Alto loam, 0 to 1 percent slopes	300	(1)	Kirvin fine sandy loam, 3 to 8 percent slopes	5,140	.8
Arenosa fine sand, 1 to 8 percent slopes	10,090	1.5	Kirvin complex, 5 to 20 percent slopes	10,840	1.6
Axtell fine sandy loam, 0 to 3 percent slopes	4,250	.6	Kirvin complex, graded, 2 to 8 percent slopes	3,060	.5
Axtell fine sandy loam, 2 to 5 percent slopes, eroded	3,940	.6	Kirvin-Sacul association, sloping	75,810	11.0
Axtell fine sandy loam, 5 to 12 percent slopes	8,030	1.2	Kirvin stony soils, 5 to 20 percent slopes	8,610	1.3
Axtell-Wrightsville complex, 0 to 1 percent slopes	2,340	.3	Konawa fine sandy loam, 2 to 5 percent slopes	970	.1
Bernaldo fine sandy loam, 0 to 1 percent slopes	1,170	.2	Konawa soils, 5 to 8 percent slopes, eroded	2,270	.3
Bowie fine sandy loam, 1 to 3 percent slopes	9,730	1.4	Kullit fine sandy loam, 1 to 3 percent slopes	6,280	.9
Bowie fine sandy loam, 3 to 8 percent slopes	8,880	1.3	Larue loamy fine sand, 1 to 3 percent slopes	5,540	.8
Burleson clay	1,050	.2	Larue loamy fine sand, 3 to 8 percent slopes	13,630	2.0
Chipley fine sand, 0 to 5 percent slopes	2,980	.4	Leefield loamy fine sand, 1 to 5 percent slopes	4,170	.6
Darco fine sand, 1 to 8 percent slopes	83,300	12.1	Lufkin fine sandy loam, 0 to 1 percent slopes	5,040	.7
Darco, Kirvin, and Tenaha soils, sloping	51,200	7.5	Nahatche and Wehadkee soils	34,740	5.0
Dougherty loamy fine sand, 1 to 5 percent slopes	780	.1	Nimrod loamy fine sand, 0 to 3 percent slopes	1,620	.2
Elrose fine sandy loam, 1 to 3 percent slopes	10,300	1.5	Normangee clay loam, 1 to 3 percent slopes	740	.1
Elrose fine sandy loam, 3 to 8 percent slopes	11,430	1.7	Normangee clay loam, 3 to 8 percent slopes	1,520	.2
Elrose fine sandy loam, 8 to 12 percent slopes	2,410	.4	Pelham loamy fine sand, 0 to 5 percent slopes	1,970	.3
Eustis fine sand, 2 to 8 percent slopes	9,090	1.3	Robinsonville fine sandy loam	9,630	1.4
Ferris clay, 5 to 8 percent slopes, eroded	400	(1)	Sacul fine sandy loam, 1 to 5 percent slopes	4,540	.7
Freestone fine sandy loam, 0 to 1 percent slopes	1,220	.2	Stidham loamy fine sand, 1 to 5 percent slopes	4,940	.7
Freestone fine sandy loam, 1 to 5 percent slopes	1,880	.3	Susquehanna fine sandy loam, 1 to 5 percent slopes	1,730	.3
Freestone-Lufkin complex	2,090	.3	Susquehanna soils, 3 to 10 percent slopes, eroded	2,300	.3
Fuquay loamy fine sand, 0 to 3 percent slopes	42,210	6.1	Thenas fine sandy loam	30,330	4.4
Fuquay loamy fine sand, 3 to 8 percent slopes	52,340	7.6	Trawick fine sandy loam, 2 to 8 percent slopes	7,230	1.1
Galey fine sandy loam, 0 to 3 percent slopes	1,460	.2	Trawick fine sandy loam, 8 to 20 percent slopes	4,190	.6
Garner clay	3,340	.5	Trawick and Bub soils, moderately steep	38,520	5.6
Hannahatchee fine sandy loam	6,700	1.0	Trep loamy fine sand, 1 to 5 percent slopes	7,400	1.1
Heiden clay, 3 to 8 percent slopes	980	.1	Trinity clay	14,950	2.2
Kaufman clay	6,120	.9	Wilson clay loam, 0 to 3 percent slopes	1,030	.2
Kaufman clay, frequently flooded	25,560	3.7	Wrightsville clay loam	2,930	.4
			Water	3,220	.4
			Total	687,360	100.0

[1] Less than 0.05 percent.

Alto Series

The Alto series consists of deep, nearly level to gently sloping loamy soils on uplands. These soils formed under a pine-hardwood forest in marine sediment high in glauconite.

In a representative profile the surface layer is brown, neutral fine sandy loam about 8 inches thick. The next layer extends to a depth of 68 inches. The upper 10 inches is dark yellowish-brown, medium acid clay loam; the next 14 inches is mottled, yellowish-brown, strongly acid clay; and the lower 36 inches is mottled, yellowish-red, strongly acid clay loam. The underlying material extends to a depth of 80 inches and is dark yellowish-brown clay and weathered glauconite.

Alto soils are moderately well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is slow.

Representative profile of Alto fine sandy loam, 1 to 3 percent slopes, about 1.3 miles southeast of Elkhart on Farm Road 1817, then 50 feet south of road, in a pasture:

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak, medium, subangular blocky structure; hard, friable; few worm casts; common, fine iron oxide concretions; neutral; clear, wavy boundary.

B21t—8 to 18 inches, dark yellowish-brown (10YR 4/4) clay loam, same color dry; many, medium, prominent mottles of red (2.5YR 4/6); moderate, fine and medium, subangular blocky structure; very hard, firm; clay films on most peds; 15 percent, by volume, fine iron oxide concretions; medium acid; gradual, wavy boundary.

B22t—18 to 32 inches, yellowish-brown (10YR 5/8) clay; prominently and coarsely mottled with red (2.5YR 4/6) approximately 40 percent of horizon is red; moderate, medium and fine, subangular blocky structure; very hard, firm; clay films on most peds; about 20 percent fine iron oxide concretions; strongly acid; gradual, wavy boundary.

B23t—32 to 50 inches, yellowish-red (5YR 5/6) clay loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/8) and few, medium, prominent mottles of light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; very hard, firm; almost continuous clay films on surface of peds; few, fine, rounded concretions of iron oxide; strongly acid; gradual, wavy boundary.

B24t—50 to 68 inches, yellowish-red (5YR 5/6) clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/8) and red (2.5YR 4/6) and few, medium, distinct mottles of light brownish gray (10YR 6/2); weak, coarse, blocky structure; very hard, firm; few clay films; few, fine, black, ferruginous concretions and few small fragments of ironstone; strongly acid; gradual, smooth boundary.

C—68 to 80 inches, dark yellowish-brown (10YR 4/4) clay and weathered glauconite; massive; very hard;

small fragments of glauconitic sandstone; medium acid.

The solum ranges from 60 to 80 inches in thickness. It has few to many iron oxide concretions throughout.

The A horizon is 5 to 12 inches thick, is dark brown, reddish brown, or brown, and is fine sandy loam or loam. It is slightly acid to neutral.

The Bt horizon is yellowish red, strong brown, yellowish brown, dark yellowish brown, or dark brown. It is mottled in most places with contrasting shades of these colors and with gray in the lower part. It is slightly acid to strongly acid clay or clay loam.

The C horizon is mainly weathered glauconite and greensand. It is medium acid to mildly alkaline.

Alto fine sandy loam, 1 to 3 percent slopes (AfB).—This soil is above the heads of small drains and on foot slopes of low ridges. It has the profile described as representative of the Alto series.

Included with this soil in mapping are small areas of Alto loam and Bowie and Trawick soils.

This Alto fine sandy loam is used mostly for pasture. The hazard of erosion is slight to moderate. Capability unit IIe-2; pasture and hay group 8C; woodland group 3o7; Redland grazing group.

Alto loam, 0 to 1 percent slopes (AlA).—This soil is in saddles on the higher ridges. It has a brown loam surface layer about 6 inches thick. The next layer is yellowish-brown clay loam about 26 inches thick. Below this is yellowish-red clay loam about 36 inches thick. The underlying material is dark yellowish-brown clay and weathered glauconite that extends to a depth of 80 inches.

Included with this soil in mapping are small areas of Alto fine sandy loam and Bowie and Trawick soils.

All of this Alto loam has been cleared of timber and was cultivated in the past, but it is now in pasture. The hazard of erosion is slight. Capability unit I-1; pasture and hay group 8C; woodland group 3o7; Redland grazing group.

Arenosa Series

The Arenosa series consists of deep, gently sloping to sloping sandy soils. These soils formed in beds of sand under a hardwood forest and grass.

In a representative profile the surface layer is brown, slightly acid, loose fine sand about 8 inches thick. The next layer is light-brown, medium acid fine sand 36 inches thick. Below this is light yellowish-brown, medium acid fine sand that extends to a depth of 108 inches.

Arenosa soils are well drained. Permeability is very rapid, and the available water capacity is low. Runoff is very slow.

Representative profile of Arenosa fine sand, 1 to 8 percent slopes, about 15 miles north of Palestine on Texas Highway 19, then 1.25 miles east of Bois D'Arc on a county road and 100 feet south of the road, in a wooded pasture:

A1—0 to 8 inches, brown (10YR 4/3) fine sand, pale brown (10YR 6/3) dry; single grained; soft, loose; slightly acid; clear, smooth boundary.

C1—8 to 44 inches, light-brown (7.5YR 6/4) fine sand, pink (7.5YR 7/4) dry; single grained; loose; brownish coatings on sand grains; medium acid; gradual, wavy boundary.

C2—44 to 108 inches, light yellowish-brown (10YR 6/4) fine sand, very pale brown (10YR 8/4) dry; single grained; loose; brownish coatings on sand grains; medium acid.

Sand extends to a depth of more than 80 inches. The A horizon is 5 to 8 inches thick, is pale brown, brown, or yellowish brown, and is fine sand or loamy fine sand. It is slightly acid to neutral.

The C horizon is pink, very pale brown, pale brown, light yellowish brown, or light brown. It is medium acid to neutral.

Arenosa fine sand, 1 to 8 percent slopes (ArD).—This gently sloping to sloping soil is in irregular areas 20 to about 800 acres in size. Slopes are mostly 1 to 5 percent.

Included with this soil in mapping are small areas of Darco fine sand and Fuquay loamy fine sand.

This Arenosa fine sand is used mostly for pasture, but small areas are used for watermelon and peas (fig. 4). This soil is poorly suited to cultivation, but it is suited to improved bermudagrass and lovegrass. The hazard of soil blowing is severe. Capability unit IVs–1; pasture and hay group 9B; woodland group 5s3; Deep Sand grazing group.

Axtell Series

The Axtell series consists of deep, nearly level to strongly sloping loamy soils. These soils formed mostly under hardwood trees in acid to alkaline clayey sediment.

In a representative profile the surface layer is pale-brown fine sandy loam about 6 inches thick that ranges from very strongly acid to moderately alkaline. The next layer is very firm clay about 60 inches thick. It is yellowish red and mottled with shades of yellow, brown, red, and gray in the upper part, and it is light olive brown mottled with brown in the lower part. The underlying material is light yellowish-brown, moderately alkaline clay that extends to a depth of 82 inches.

Axtell soils are moderately well drained to well drained. Permeability is very slow, and the available water capacity is high. Runoff is slow to rapid. These are plastic soils that have high shrink-swell properties. Cracks form in the more clayey layers during dry periods.

Representative profile of Axtell fine sandy loam, 0 to 3 percent slopes, about 15 miles northwest of Palestine, 0.80 mile west of Massey Lake on a county road and 200 feet south of road, in an idle field:

Ap—0 to 6 inches, pale-brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; massive; hard, friable; few fine pores; few small worm casts; slightly acid; abrupt, wavy boundary.

B21t—6 to 12 inches, yellowish-red (5YR 4/6) clay, yellowish red (5YR 5/6) dry; few, medium, distinct mottles of light yellowish brown (10YR 6/4); moderate, medium and fine, blocky structure; extremely hard, very firm; few lenses or streaks of very pale brown sand grains on surface of peds; common clay films on peds; few black concretions of ferromanganese; strongly acid; clear, wavy boundary.

B22t—12 to 20 inches, distinctly and coarsely mottled red (2.5YR 5/6) and pale-yellow (2.5Y 7/4) clay; moderate, medium and fine, blocky structure; extremely hard, very firm; few medium pores; common clay films on surface of peds; few lenses of sand grains on surface of peds; few fine concre-

Figure 4.—**Young watermelon plants on Arenosa fine sand, 1 to 8 percent slopes.**

tions of ferromanganese; very strongly acid; gradual, wavy boundary.

B23t—20 to 30 inches, distinctly and coarsely mottled yellowish-red (5YR 5/6) and pale-yellow (2.5Y 7/4) clay; common, medium, distinct mottles of light gray (2.5Y 7/2); moderate, medium and coarse, blocky structure; extremely hard, very firm; few fine and medium pores; common clay films on surface of peds; few shiny pressure faces; very strongly acid; diffuse, wavy boundary.

B24t—30 to 42 inches, distinctly and coarsely mottled red (2.5YR 5/6), light-gray (2.5Y 7/2), light yellowish-brown (2.5Y 6/4), and reddish-yellow (7.5YR 6/6) clay; moderate, medium and coarse, blocky structure; extremely hard, very firm; few clay films on surface of peds; few shiny pressure faces; strongly acid; diffuse, wavy boundary.

B25t—42 to 48 inches, distinctly and coarsely mottled light-gray (2.5Y 7/0), light yellowish-brown (2.5Y 6/4), and yellowish-red (5YR 5/6) clay; moderate, medium and coarse, blocky structure; extremely hard, very firm; few clay films on surface of peds; few, fine, black concretions of ferromanganese; medium acid; gradual, wavy boundary.

B3—48 to 66 inches, light olive-brown (2.5Y 5/4) clay; few, distinct, coarse mottles of brown (10 YR 4/3; weak, coarse, blocky structure; extremely hard, very firm; few clay films on surface of peds; few, fine, calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C—66 to 82 inches, light yellowish-brown (2.5Y 6/4) clay; common faint streaks of pale yellow (2.5Y 7/4) and yellow (10YR 7/6); massive; extremely hard, very firm; few black concretions and soft masses of ferromanganese; calcareous; moderately alkaline.

The solum is 42 to 70 inches thick. The A horizon is 5 to 15 inches thick, is very pale brown to dark grayish brown, and is slightly acid to strongly acid. An A2 horizon, where present, is slightly lighter in color than either the A1 or the Ap horizon.

The B2t horizon ranges from yellowish red to yellowish brown and has few to many mottles of red, brown, yellow, gray, and olive. It is clay or clay loam. This horizon is strongly acid or very strongly acid in the upper part and is strongly acid to neutral in the lower part. The B3 horizon is gray to olive, has mottles of yellow and brown, and is medium acid to moderately alkaline.

The C horizon is clay or sandy clay, is slightly acid to moderately alkaline, and is calcareous or noncalcareous.

Axtell fine sandy loam, 0 to 3 percent slopes (AtB).—This soil is on interstream divides in areas mostly 5 to 50 acres in size. Slopes are plane to convex. This soil has the profile described as representative of the Axtell series.

Included with this soil in mapping are small areas of Galey and Lufkin soils.

Most areas of this Axtell soil have been cleared and

cultivated in the past, but they are now in post oak forest and are used for pasture. A small acreage is cultivated. Runoff is slow to medium. The hazard of erosion is moderate where runoff concentrates and vegetation is thin or has been removed. Capability unit IIIe-1; pasture and hay group 8A; woodland group 5c0; Tight Sandy Loam grazing group.

Axtell fine sandy loam, 2 to 5 percent slopes, eroded (AtC2).—This soil is on ridges and on the sides of drainageways. Much of the surface layer has been eroded, and in spots it has been removed. Gullies and rills are common. Gullies are mostly shallow and can be crossed with farm machinery.

The surface layer is pale-brown, medium acid fine sandy loam about 5 inches thick. The subsoil is yellowish-red clay that is mottled with shades of red and gray and extends to a depth of 30 inches. Below this is yellowish-brown clay that is mottled with light gray, red, and brownish yellow and extends to a depth of 45 inches. The underlying material is light yellowish-brown sandy clay that extends to a depth of 60 inches.

Included with this soil in mapping are small areas of Galey, Konawa, and Normangee soils.

About 70 percent of this Axtell fine sandy loam has been cleared of timber and was cultivated at one time, but it is best suited to pasture. Some fields have been planted to pasture. Runoff is medium. The hazard of erosion is severe where vegetation is thin or has been removed. Capability unit IVe-1; pasture and hay group 8A; woodland group 5c0; Tight Sandy Loam grazing group.

Axtell fine sandy loam, 5 to 12 percent slopes (AtE).—This soil is on the sides of deeply dissected drainageways and escarpments. Slopes are mostly convex. About 40 percent of the total acreage is eroded. Gullies are mostly shallow and broad.

The surface layer is dark grayish-brown fine sandy loam about 6 inches thick. The subsoil is mottled yellowish-brown, acid clay that extends to a depth of about 50 inches. The next layer is light yellowish-brown, mildly alkaline clay sediment that extends to a depth of 70 inches.

Included with this soil in mapping are small areas of Konawa and Normangee soils. Konawa soils are mostly on the lower parts of convex slopes, and Normangee soils are on the lower parts of concave slopes.

About 65 percent of this Axtell fine sandy loam has been cleared of timber and was cultivated at one time, but all of it is now used for pasture. This soil is not suitable for cultivation. Runoff is rapid. The hazard of erosion is severe where vegetation is thin or has been removed. Capability unit VIe-1; pasture and hay group 8B; woodland group 5c0; Tight Sandy Loam grazing group.

Axtell-Wrightsville complex, 0 to 1 percent slopes (AwA).—This mapping unit is in broad, flat areas that have slopes of mostly less than 0.5 percent. Axtell fine sandy loam makes up about 45 percent of the mapping unit, Wrightsville clay loam 40 percent, and other soils the remaining 15 percent. Axtell soil is on narrow, low ridges and small knolls that are 6 to 24 inches higher than the Wrightsville soil.

The Axtell soil has a very pale brown, slightly acid, fine sandy loam surface layer about 7 inches thick. The subsoil is about 63 inches thick. The upper part is yellowish-red, very strongly acid clay that is mottled with red and light gray. The lower part is yellowish-brown, strongly acid clay. Light yellowish-brown, calcareous sandy clay is at a depth of about 70 inches.

The Wrightsville soil has a grayish-brown, clay loam surface layer about 11 inches thick. The next layer is light-gray, very strongly acid clay about 39 inches thick. Below this, beginning at a depth of about 50 inches, is grayish-brown sediment.

Included in this mapping unit are small areas of Freestone and Galey soils on the mounds near the Axtell soil and Lufkin soils in low areas near the Wrightsville soil.

Most areas of this mapping unit are in hardwood forest and are used for pasture. A few areas have been cleared and cultivated in the past, but these are now in pasture. Capability unit IVw-1; pasture and hay group 8E; woodland group 5c0; Tight Sandy Loam grazing group.

Bernaldo Series

The Bernaldo series consists of deep, nearly level loamy soils on high stream terraces. They formed in loamy sediment under hardwood forest.

In a representative profile the surface layer is medium acid fine sandy loam about 12 inches thick. It is brown in the upper 8 inches and dark brown in the lower 4 inches. Below this is 12 inches of yellowish-brown, slightly acid fine sandy loam and about 6 inches of light yellowish-brown, slightly acid fine sandy loam that is mottled. The next layer extends to a depth of 84 inches and is yellowish-brown, medium acid sandy clay loam in the upper part and mottled in shades of gray, brown, and red in the lower part.

Bernaldo soils are well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is slow.

Representative profile of Bernaldo fine sandy loam, 0 to 1 percent slopes, about 2 miles north of Tucker on Farm Road 645, then 0.9 mile west on a county road, then 660 feet east of the road, in a pasture:

Ap—0 to 8 inches, brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; weak, medium, granular structure; slightly hard, very friable; abundant fine roots; few iron oxide concretions up to 10 millimeters in diameter; medium acid; clear, smooth boundary.

A1—8 to 12 inches, dark-brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; moderate to weak, fine, granular structure; slightly hard, very friable; many fine roots; medium acid; gradual, wavy boundary.

A21—12 to 24 inches, yellowish-brown (10YR 5/4) fine sandy loam, very pale brown (10YR 7/4) dry; massive; slightly hard, very friable; many fine and medium pores; few ferromanganese concretions up to 10 millimeters in diameter; few worm casts of darker material from above; slightly acid; gradual, wavy boundary.

A22—24 to 30 inches, light yellowish-brown (10YR 6/4) fine sandy loam, very pale brown (10YR 8/4 dry; common mottles of yellowish brown (10YR 5/6); massive; slightly hard, very friable; many fine and medium pores; common ferromanganese concretions

3 to 10 millimeters in diameter; slightly acid; gradual, wavy boundary.

B21t—30 to 54 inches, yellowish-brown (10YR 5/6) sandy clay loam, yellow (10YR 7/6) dry; weak, medium, subangular blocky structure; hard, friable; medium acid; gradual, wavy boundary.

B22t&A'2—54 to 72 inches, prominently and coarsely mottled strong-brown (7.5YR 5/6) and red (2.5YR 4/6) sandy clay loam; moderate, medium, subangular blocky structure; hard, friable; few clay films on surface of peds; about 10 percent light-gray (10YR 7/1) vertical tongues 2 to 5 centimeters wide; medium acid; gradual, wavy boundary.

B23t—72 to 84 inches, distinctly and coarsely mottled strong-brown (7.5YR 5/6) and red (2.5YR 4/6) sandy clay loam; common, medium, distinct mottles of gray (10YR 6/1); weak, coarse, subangular blocky structure; very hard, friable; few thin clay films on surface of peds; medium acid.

The solum is more than 60 inches thick. It is slightly acid to medium acid. The A horizon ranges from 16 to 32 inches in thickness. The Ap or A1 horizon is dark grayish brown, dark brown, brown, grayish brown, or light brownish gray. The A2 horizon is yellowish brown, light yellowish brown, or pale brown and has few to many, black, ferromanganese concretions.

The B2t horizon is light yellowish brown, yellowish brown, or brownish yellow in the upper part. In some profiles this horizon has few to common mottles of reddish yellow and yellowish red in the upper part. The B2t horizon is gray in the lower part. It has common to many mottles of red, yellow, and brown or is mottled with shades of yellow, brown, red, and gray. This horizon is sandy clay loam or clay loam.

Bernaldo fine sandy loam, 0 to 1 percent slopes (BeA).—This nearly level soil is in areas that have a billowy surface and are 20 to about 600 acres in size.

Included with this soil in mapping are areas of Konawa and Stidham soils on low ridges and Freestone and Lufkin soils in low swales.

This Bernaldo fine sandy loam is mostly in pasture. About one-fourth of it is in hardwood forest and is grazed. A small acreage is cultivated. Water stands in low areas during winter and early in spring and hinders early planting and cultivation. Capability unit I-2; pasture and hay group 8C; woodland group 2o7; Sandy Loam grazing group.

Bowie Series

The Bowie series consists of deep, gently sloping to sloping loamy soils on uplands. These soils formed in beds of acid, unconsolidated, loamy and clayey material under a pine-hardwood forest.

In a representative profile the surface layer is brown, medium acid fine sandy loam about 4 inches thick. Below this is 9 inches of light yellowish-brown, medium acid fine sandy loam. The next layer extends to a depth of 75 inches. It is yellowish-brown, medium acid and strongly acid sandy clay loam that has few to common mottles in the upper 30 inches. Below this is mottled dark-red, reddish-brown, and yellowish-brown sandy clay loam that is about 10 to 15 percent plinthite.

Bowie soils are moderately well drained to well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is slow to medium.

Representative profile of Bowie fine sandy loam, 1 to 3 percent slopes, 6.25 miles northeast of Elkhart on Farm Road 1817, then 1.6 miles northwest on a county road and 100 feet west of the road, in an abandoned field:

Ap—0 to 4 inches, brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak, granular structure; slightly hard, friable; medium acid; clear, smooth boundary.

A2—4 to 13 inches, light yellowish-brown (10YR 6/4) fine sandy loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable; medium acid; clear, wavy boundary.

B21t—13 to 23 inches, yellowish-brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; few, fine to medium, distinct mottles of yellowish red (5YR 5/8); weak, medium, subangular blocky structure; hard, friable; few pores; few thin clay films on surface of peds; few ferromanganese concretions; medium acid; clear, wavy boundary.

B22t—23 to 43 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, medium, prominent mottles of red (2.5YR 4/6); moderate, fine to medium, subangular blocky structure; hard, friable; few thin clay films on surface of some peds; strongly acid; diffuse, wavy boundary.

B23t—43 to 65 inches, mottled reddish-brown (5YR 5/4), yellowish-brown (10YR 5/6), and dark-red (2.5YR 3/6) sandy clay loam; weak, medium to coarse, subangular blocky structure; hard, friable; common fine pores; red mottles are plinthite and make up about 10 percent of mass; common small pockets of stripped sand grains; clay films on surface of peds; strongly acid; diffuse, irregular boundary.

B24t—65 to 75 inches, same as B23t horizon, but 10 to 15 percent plinthite; very strongly acid.

The solum is more than 60 inches thick. The A horizon is 6 to 18 inches thick and is slightly acid to medium acid. The A1 or Ap horizon is brown, grayish brown, or dark grayish brown. The A2 horizon is brown, pale brown, light yellowish brown, or very pale brown.

The B21t and B22t horizons are yellowish-brown, brownish-yellow, or yellow sandy clay loam, clay loam, or fine sandy loam with red, strong-brown, or yellowish-red mottles. They are medium acid to very strongly acid. The lower B2t horizons are mottled with yellowish brown, gray, yellowish red, brownish yellow, reddish brown, and shades of red.

Bowie fine sandy loam, 1 to 3 percent slopes (BoB).—This gently sloping soil is on uplands in areas 10 to 50 acres in size. It has the profile described as representative of the Bowie series. Slopes are plane to convex and mainly 1 to 2.5 percent. A few areas have some sheet erosion and gullies or gully scars.

Included with this soil in mapping are small areas of Elrose, Kullit, and Lufkin soils. Elrose soils are on low ridges and knolls, and Kullit soils are along foot slopes and depressed areas that receive runoff. Lufkin soils are in less sloping areas.

Most of this Bowie fine sandy loam has been cleared of timber and was cultivated in the past, but it is now mostly in pasture. The rest is in pine-hardwood forest. A small acreage is still in cultivation. Capability unit IIe-1; pasture and hay group 8C; woodland group 3o1; Sandy Loam grazing group.

Bowie fine sandy loam, 3 to 8 percent slopes (BoD).—This gently sloping to sloping soil is on uplands in irregular areas 5 to 50 acres in size. Slopes are mostly 4 to 8 percent.

The surface layer, about 12 inches thick, is medium acid fine sandy loam that is dark grayish brown in the upper part and pale brown in the lower part. The next layer is yellowish-brown, strongly acid sandy clay loam that has yellowish-red and strong-brown mottles and extends to a depth of 34 inches. Below this is very strongly acid sandy clay loam that extends to a depth of 60 inches and is mottled in shades of brown, red, and

gray. The underlying sediment is very strongly acid, gray, yellowish-red, and brownish-yellow sandy clay loam and extends below a depth of 78 inches.

Included with this soil in mapping are small areas of Fuquay and Kirvin soils. Kirvin soils are on the tops of ridges and on the steeper parts of slopes. Fuquay soils are in fringe areas that adjoin deep sands.

Most of this Bowie fine sandy loam has been cleared of timber and was cultivated in the past, but it is now used for pasture. Capability unit IIIe-4; pasture and hay group 8C; woodland group 3o1; Sandy Loam grazing group.

Bub Series

The Bub series consists of shallow, gently sloping to moderately steep, loamy gravelly soils. These soils formed in marine sediment rich in iron under a pine and hardwood forest.

In a representative profile the surface layer is 4 inches of dark reddish-brown, slightly acid gravelly clay loam. It is about 10 percent fine ironstone pebbles. The next layer is slightly acid clay that contains a few ironstone pebbles and fragments of glauconite and extends to a depth of 18 inches. It is red in the upper 8 inches and yellowish red in the lower 6 inches. The underlying material is partly weathered brown glauconite that is clay loam in texture and extends to a depth of 28 inches.

Bub soils are well drained. Permeability is moderately slow, and the available water capacity is low. Runoff is rapid.

The Bub soils are mapped only in an undifferentiated unit with the Trawick soils.

Representative profile of Bub gravelly clay loam in an area of Trawick and Bub soils, moderately steep, about 2.25 miles southeast of the courthouse in Palestine on U.S. Highway 84, then 1.3 miles northeast on Farm Road 1137 and 50 feet north of the road:

A1—0 to 4 inches, dark reddish-brown (2.5YR 3/4) gravelly clay loam; moderate, medium, blocky and granular structure; very hard, firm; 10 percent, by volume, fine ironstone pebbles; many fine roots; slightly acid; clear, smooth boundary.

B21t—4 to 12 inches, red (2.5YR 5/6) clay; strong, fine and medium, blocky structure; very hard, firm; few, fine, ironstone pebbles; continuous clay films; slightly acid; gradual, wavy boundary.

B22t—12 to 18 inches, yellowish-red (5YR 4/6) clay; moderate, medium, blocky structure; very hard, firm; clay films on surface of most peds; few brittle fragments of glauconite that are yellowish brown; slightly acid; abrupt, wavy boundary.

C—18 to 28 inches, brown (7.5YR 4/4) partly weathered glauconite that is clay loam in texture; some yellowish-red clay in crevices; slightly acid.

The solum is 12 to 20 inches thick and is medium acid or slightly acid. The surface has coarse fragments that range in size from a few inches to several feet in diameter.

The A horizon is 3 to 6 inches thick, is gravelly clay loam, clay loam, sandy clay loam, loam, or fine sandy loam, and is dark reddish brown or dark brown. It is 10 to 35 percent coarse fragments.

The Bt horizon is red, yellowish red, dark red, or strong brown. It ranges from a few to 35 percent coarse fragments that range from a few millimeters to about 6 inches in diameter.

The C horizon is weathered glauconite in the upper part and greensand marl in the lower part. Strata of strongly cemented sandstone are common in most places.

Burleson Series

The Burleson series consists of deep, moderately well drained, nearly level to gently sloping clay soils. These soils formed in alkaline clayey sediment under mid and tall grasses.

In a representative profile the upper 12 inches of the surface layer is very dark gray, mildly alkaline clay. The next layer is black, mildly alkaline clay that extends to a depth of 46 inches. Below this is very dark gray and dark-gray, moderately alkaline clay that extends to a depth of 70 inches.

Burleson soils are moderately well drained. Permeability is very slow, and the available water capacity is high. Runoff is slow. These soils are plastic and have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Burleson clay, 1.2 miles west of Cayuga on U.S. Highway 287, then 100 feet north, in a native pasture, in a microbasin of the gilgai microrelief:

A11—0 to 12 inches, very dark gray (10YR 3/1) clay; weak, coarse, blocky structure parting to moderate, fine, blocky; very hard, very firm; shiny surface on peds; mildly alkaline; diffuse, wavy boundary.

A12—12 to 46 inches, black (10YR 2/1) clay; moderate, fine to medium, blocky structure; extremely hard, very firm; few wedge-shaped peds; mildly alkaline; diffuse, wavy boundary.

A13—46 to 62 inches, very dark gray (10YR 3/1) clay; moderate, fine to medium, blocky structure; extremely hard, very firm; few intersecting slickensides; moderately alkaline; diffuse, wavy boundary.

AC—62 to 70 inches, dark-gray (10YR 4/1) clay; narrow vertical streaks of light yellowish brown; weak, fine to coarse, blocky structure; extremely hard, very firm; common fine concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

The solum averages more than 36 inches in thickness. It ranges from 36 inches thick over microknolls to 70 inches or more in microbasins. Gilgai relief consists of microknolls and microbasins and microridges and microvalleys. Winding ridges and valleys are continuous for several hundred feet in some places. Highs are in 40 to 60 percent of areas and are 5 to 10 inches higher than lows.

The A11 and A12 horizons are black, very dark gray, or dark gray when moist and are medium acid to moderately alkaline. The AC horizon is gray or dark gray. Intersecting slickensides are common at a depth of 20 to 40 inches.

Burleson clay (Bu).—This nearly level to gently sloping soil is in areas 10 to about 200 acres in size. Slopes are mainly less than 1 percent but range to 2.5 percent in a few places.

Included with this soil in mapping are small areas of Garner, Heiden, and Normangee soils. Garner soils are in the lower areas; Heiden soils are more sloping; and Normangee soils are on ridges.

Most areas of this Burleson clay are in pasture, but some areas are cultivated, mainly to seasonal grazing crops. This soil is difficult to work, and a crust forms on the surface after rain. Capability unit IIw-3; pasture and hay group 7A; woodland group 5c0; Blackland grazing group.

Chipley Series

The Chipley series consists of deep, nearly level to gently sloping sandy soils on foot slopes and small stream deltas that receive runoff from adjoining slopes. These soils formed under a pine-hardwood forest.

In a representative profile the surface layer is strongly acid, dark grayish-brown, loose fine sand about 9 inches thick. The next layer is 29 inches of very pale brown, very strongly acid fine sand that is mottled with shades of yellow and brown. The next layer is 44 inches of light-gray or white, very strongly acid fine sand that is mottled with shades of yellow.

Chipley soils are moderately well drained. Permeability is rapid, and the available water capacity is low. Runoff is slow.

Representative profile of Chipley fine sand, 0 to 5 percent slopes, 11.3 miles southeast of Palestine on Farm Road 323, then 1.25 miles northeast on a county road and 70 feet east of the road, in a pine-hardwood forest:

A1—0 to 9 inches, dark grayish-brown (10YR 4/2) fine sand; weak, granular structure; soft, loose; few roots; strongly acid; gradual, smooth boundary.

C1—9 to 38 inches, very pale brown (10YR 8/3) fine sand; few, fine, distinct, yellow (10YR 7/6) and brownish-yellow (10YR 6/6) mottles; single grained; soft, loose; very strongly acid; gradual, irregular boundary.

C2—38 to 82 inches, light-gray (10YR 7/2) fine sand; common, medium, distinct, yellow (10YR 7/6) and pale-yellow (2.5Y 7/4) mottles that become white in lower part; single grained; soft, loose; very strongly acid.

The A horizon is 5 to 10 inches thick, ranges from very dark grayish brown to grayish brown, and is fine sand or loamy fine sand.

The C horizon is sand or fine sand. It is very pale brown, pale brown, or light yellowish brown in the upper part and light brownish gray to white below a depth of about 38 inches. This horizon has mottles of yellow, yellowish brown, brownish yellow, or pale yellow. It is strongly acid to very strongly acid.

Chipley fine sand, 0 to 5 percent slopes (ChC).—This soil is in areas 5 to 600 acres in size.

Included with this soil in mapping are small areas of Darco, Leefield, and Pelham soils. Darco soils are on ridges. Pelham and Leefield soils are in concave, lower areas.

This Chipley fine sand is mostly in timber. The rest is in open pasture. A water table is at a depth of 24 to 60 inches for short periods after heavy rains. Capability unit IIIw-1; pasture and hay group 9C; woodland group 3w2; Sandy grazing group.

Darco Series

The Darco series consists of deep, gently sloping to moderately steep sandy soils on uplands. These soils formed in sandy marine sediment under a pine-hardwood or hardwood forest.

In a representative profile the surface layer is brown, slightly acid fine sand about 9 inches thick. Below this is about 40 inches of yellowish-brown, medium acid fine sand. The next layer is 18 inches of red, very strongly acid sandy clay loam that is prominently mottled with strong brown. Below this is red, very strongly acid sandy loam that extends to a depth of 80 inches.

Darco soils are well drained to somewhat excessively drained. Permeability is moderately slow, and the available water capacity is low. Runoff is slow.

Representative profile of Darco fine sand, 1 to 8 percent slopes, 6.5 miles southeast of Elkhart on U.S. Highway 287, then 0.4 mile east of Salmon Missionary Baptist Church on a county road, then 50 feet north of the road:

A1—0 to 9 inches, brown (10YR 5/3) fine sand; weak, subangular blocky structure; soft, very friable; common fine roots; slightly acid; gradual, smooth boundary.

A21—9 to 27 inches, yellowish-brown (10YR 5/4) fine sand; single grained; soft, loose; common fine roots; medium acid; gradual, smooth boundary.

A22—27 to 49 inches, yellowish-brown (10YR 5/4) fine sand; few, fine, faint mottles of yellowish red; single grained; soft, loose; few ironstone fragments in lower part; medium acid; gradual, smooth boundary.

B21t—49 to 67 inches, red (2.5YR 4/6) sandy clay loam; common, medium and coarse, prominent mottles of strong brown (7.5YR 5/6); weak, coarse, prismatic structure parting to moderate, fine, blocky; hard, friable; few fine roots; common reddish-brown (5YR 4/4) clay films on surface of peds; very strongly acid; diffuse, smooth boundary.

B22t—67 to 80 inches, red (2.5YR 4/8) sandy loam; few, fine, strong-brown mottles and streaks; weak, coarse, prismatic structure parting to weak, fine, subangular blocky; hard, friable; few fine roots; few, thin, red (2.5YR 4/6) clay films on vertical ped surfaces; very strongly acid.

The solum is more than 80 inches thick. The A horizon is 40 to 72 inches thick and is slightly acid to very strongly acid. The A1 or Ap horizon is brown, grayish brown, dark grayish brown, or very dark grayish brown. The A2 horizon is brown, pale brown, very pale brown, yellowish brown, or light yellowish brown.

The B2t horizon is red, yellowish red, or strong brown and is mottled in shades of red or brown. Some areas have gray mottles below a depth of 50 inches. This horizon is sandy clay loam to sandy loam and is strongly acid to very strongly acid. The B2t horizon is 0 to 5 percent plinthite.

Darco fine sand, 1 to 8 percent slopes (DaD).—This gently sloping to sloping soil is on uplands in areas 10 acres to several hundred acres in size. It has the profile described as representative of the Darco series.

Included with this soil in mapping are small ridges and knolls of Arenosa soils, small areas of Fuquay soils that are along gentle side slopes, and small outcrops of Tenaha soils that are on steeper slopes.

Most of this Darco fine sand has been cleared of timber and cultivated in the past, but it is now mostly in pasture. The hazard of soil blowing is severe where this soil is left bare (fig. 5).

A small acreage is cultivated (fig. 6) Capability unit IIIs-1; pasture and hay group 9B; woodland group 4s3; Sandy grazing group.

Darco, Kirvin, and Tenaha soils, sloping (DkF).—This mapping unit is made up of soils that mainly occur together on sloping to moderately steep ridges and hillsides. Most areas are long and narrow and are 40 acres to several hundred acres in size. This mapping unit is 35 percent Darco soils, 25 percent Kirvin soils, 20 percent Tenaha soils, and 20 percent other soils. Delineations are much larger, and their composition is more variable than for most other mapping units in the

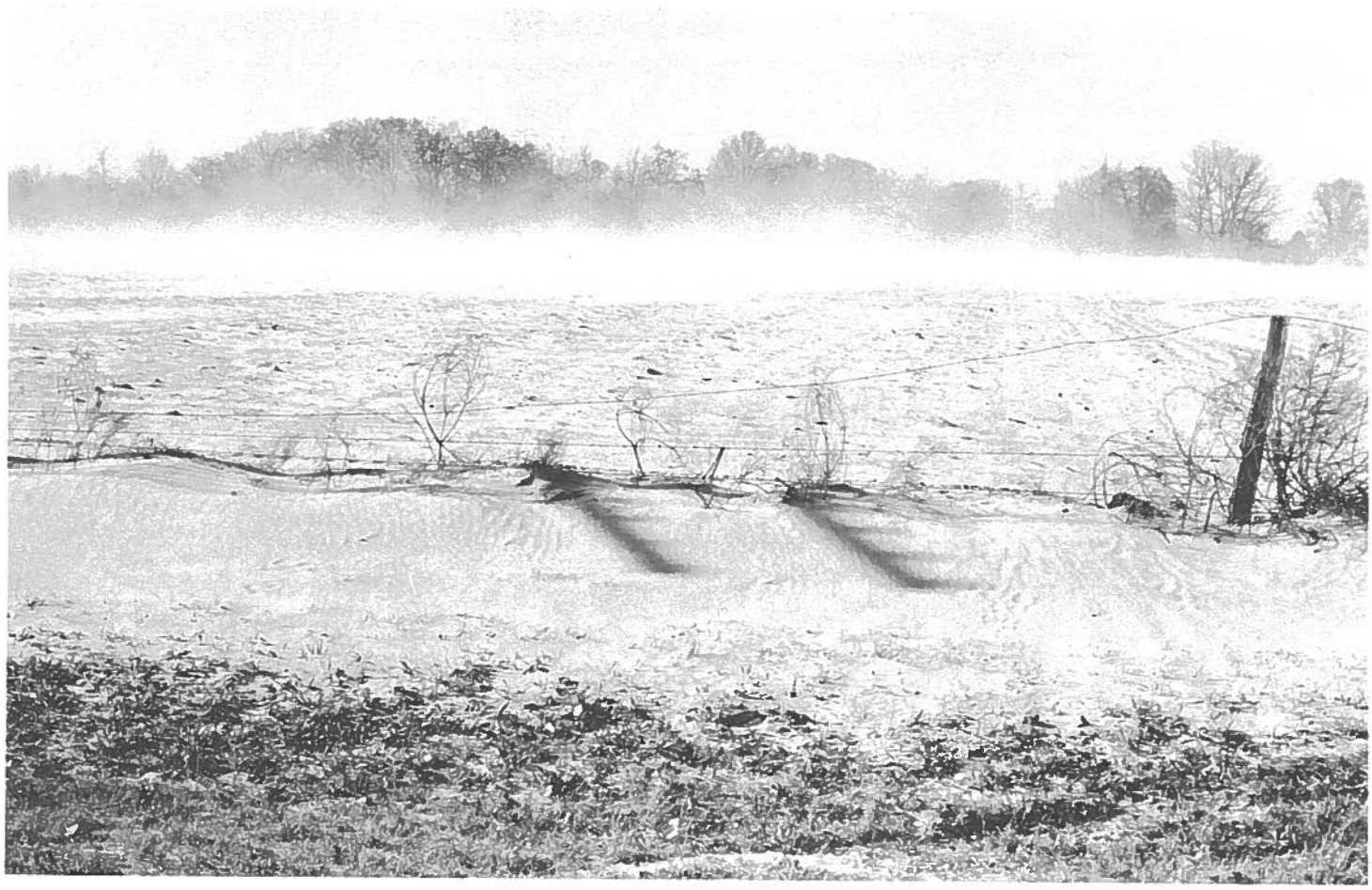

Figure 5.—**Soil blowing on Darco fine sand, 1 to 8 percent slopes. Field of peanuts was left bare after harvest.**

county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

Darco soils are on ridgetops and foot slopes. Their surface is convex and concave. These soils have a surface layer of slightly acid fine sand about 60 inches thick. It is dark grayish brown in the upper 6 inches, brown in the next 22 inches, and pale brown in the lower 32 inches. Red sandy clay loam is at a depth of 60 to 76 inches. Below this is stratified clay, sandy clay loam, and sand sediment that is mottled with gray, yellowish red, and red.

Kirvin soils are on the upper slopes, tops, and points of ridges. Their surface is convex, and slopes are mostly about 8 to 20 percent. Kirvin soils are in about 80 percent of the mapped areas. These Kirvin soils have a surface layer of medium acid, pale-brown loamy fine sand about 10 inches thick. The next layer is about 38 inches thick. It is very strongly acid clay loam that is red in the upper part and reddish brown in the lower part. The next layer is red, very strongly acid clay loam that extends to a depth of 50 inches. It is underlain by very strongly acid, gray and yellow clay loam to sandy loam sediment that extends to a depth of 60 inches.

Tenaha soils are also on the top, points, and upper slopes of ridges. Their surface is convex, and slopes range from about 8 to 20 percent. Tenaha soils are in about 75 percent of the mapped areas. A Tenaha soil in this mapping unit has the profile described as representative of the Tenaha series.

Included with these soils in mapping are small areas of Arenosa, Fuquay, Larue, and Sacul soils. Arenosa soils are along foot slopes near Darco soils. Fuquay soils are less sloping and are near Darco soils. Larue soils also are less sloping. Sacul soils are steeper and are near Kirvin and Tenaha soils.

This mapping unit is not suited to cultivation. Most of it is in timber and is used for grazing and timber production. A small acreage has been cleared and is used as improved pasture. Capability unit VIe-2; pasture and hay group 9B; woodland group 4s3; Sandy grazing group.

Dougherty Series

The Dougherty series consists of deep, gently sloping sandy soils on high river terraces. These soils formed in strongly acid to neutral sediment under a hardwood forest and tall prairie grass.

In a representative profile the surface layer is brown, slightly acid loamy fine sand about 5 inches thick. Below this is slightly acid and medium acid yellowish-brown loamy fine sandy that extends to a depth of about 34

Figure 6.—**Poor stand of peas on deep Darco fine sand, 1 to 8 percent slopes.**

inches. The next layer is about 42 inches thick. It is red, strongly acid sandy clay loam in the upper 10 inches; yellowish-red, strongly acid sandy clay loam in the middle 22 inches; and strongly acid, yellowish-red sandy loam in the lower 10 inches. The underlying material is thinly bedded loamy sand and sandy loam that is reddish yellow and strongly acid and extends to a depth of 90 inches.

Dougherty soils are well drained. Permeability is moderate, and the available water capacity is low. Runoff is slow.

Representative profile of Dougherty loamy fine sand, 1 to 5 percent slopes, 10 miles west of Tennessee Colony on Farm Road 321 to the end of this road, then 0.35 mile west on county road, then 0.3 mile south on a private road and 700 feet east of the road, in a cultivated field:

Ap—0 to 5 inches, brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak, medium, granular structure; soft, very friable; slightly acid; clear, smooth, boundary.

A21—5 to 12 inches, yellowish-brown (10YR 5/4) loamy fine sand, light yellowish brown (10YR 6/4) dry; massive; soft, very friable; slightly acid; clear, wavy boundary.

A22—12 to 34 inches, yellowish-brown (10YR 5/4) loamy fine sand, yellow (10YR 7/6) dry; massive; soft, very friable; medium acid; clear, wavy boundary.

B21t—34 to 44 inches, red (2.5YR 4/6) sandy clay loam, red (2.5YR 5/6) dry; moderate, medium, subangular blocky structure; very hard, friable; few clay films on surface of peds and clay bridging between sand grains; strongly acid; gradual, smooth boundary.

B22t—44 to 66 inches, yellowish-red (5YR 5/8) sandy clay loam, reddish yellow (5YR 6/8) dry; weak, medium, subangular blocky structure; very hard, friable; few thin clay films on surface of peds and clay bridging between sand grains; strongly acid; gradual, smooth boundary.

B3—66 to 76 inches, yellowish-red (5YR 5/6) sandy loam, reddish yellow (5YR 6/6) dry; few faint streaks of pink (5YR 7/4); weak, coarse, subangular blocky structure; hard, friable; clay coating and bridging of sand grains; strongly acid; gradual, smooth boundary.

C—76 to 90 inches, thinly bedded loamy sand and sandy loam in colors of reddish yellow (5YR 6/8); massive; slightly hard, friable; strongly acid.

The solum ranges from 45 to more than 76 inches in thickness. The A horizon is 20 to 40 inches thick. It is slightly acid or medium acid loamy fine sand or fine sand. The Ap horizon is dark brown, brown, or pale brown. The A21 and A22 horizons are pale brown, brown, or yellowish brown.

The Bt horizon is red, yellowish red, reddish yellow, or reddish brown and is slightly acid to strongly acid. It is sandy clay loam to sandy loam. The C horizon is slightly acid to strongly acid.

Dougherty loamy fine sand, 1 to 5 percent slopes (DoC).—This soil is in areas less than 50 acres in size and generally has a slope of 1.5 to 5 percent.

Included with this soil in mapping are areas of Kenney and Stidham soils and some areas that have slopes of 5 to 8 percent. Kenney soils are on low ridges, and Stidham soils are in small swales.

Most of this Dougherty loamy fine sand has been cleared of timber and cultivated in the past, but it is now in pasture. The hazard of erosion is moderate. Capability unit IIIe-2; pasture and hay group 9A; woodland group 5s0; Sandy grazing group.

Elrose Series

The Elrose series consists of deep, gently sloping to strongly sloping loamy soils on uplands. These soils formed under a pine-hardwood forest in stratified marine and alluvial sediment high in glauconitic sandstone.

In a representative profile the surface layer is fine sandy loam about 10 inches thick. It is strongly acid and reddish brown in the upper 4 inches and slightly acid and yellowish red in the lower 6 inches. Next is about 6 inches of red medium acid sandy clay loam. The next layer is strongly acid sandy clay loam that extends to a depth of 68 inches. It is red in the upper 14 inches, dark red in the middle 20 inches, and red in the lower 18 inches. Below this is 7 inches of red, strongly acid sandy loam. The underlying material is red, very strongly acid loamy fine sand that extends to a depth of 90 inches.

Elrose soils are well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow.

Representative profile of Elrose fine sandy loam, 3 to 8 percent slopes, 4 miles northeast of Denson Springs on a county road, then 50 feet north of the road, in a wooded area:

A11—0 to 4 inches, reddish-brown (5YR 4/3) fine sandy loam, light reddish brown (5YR 6/3) dry; moderate, fine and medium, granular structure; slightly hard, very friable; common fine roots; few, fine, iron-enriched pebbles; strongly acid; clear, smooth boundary.

A12—4 to 10 inches, yellowish-red (5YR 4/6) fine sandy loam, light reddish brown (5YR 6/4) dry; weak, fine, granular structure; slightly hard, very friable; common, fine and medium, iron-enriched pebbles; slightly acid; gradual, wavy boundary.

B1t—10 to 16 inches, red (2.5YR 4/6) sandy clay loam, red (2.5YR 5/6) dry; moderate, medium, subangular blocky structure; hard, friable; few fine roots; common fine pores; few clay films on surface of peds; few iron-enriched pebbles 3 to 7 millimeters in diameter; medium acid; gradual, wavy boundary.

B21t—16 to 30 inches, red (10R 4/6) sandy clay loam, red (10R 5/6) dry; moderate, medium, blocky structure parting to weak, medium, subangular blocky; very hard, firm; few fine roots; few fine pores; distinct clay films on surface of peds; common iron-enriched pebbles 3 to 7 millimeters in diameter; strongly acid; gradual, wavy boundary.

B22t—30 to 50 inches, dark-red (2.5YR 3/6) sandy clay loam, red (2.5YR 4/6) dry; moderate, medium, subangular blocky structure; hard, friable; few fine roots; few fine pores; clay films on surface of peds; few, fine, iron-enriched pebbles; few small fragments of glauconite; strongly acid; diffuse, wavy boundary.

B23t—50 to 68 inches, red (2.5YR 4/6) sandy clay loam, red (2.5YR 5/6) dry; weak, medium, subangular blocky structure; hard, friable; thin clay films on surface of peds; few, fine, iron-enriched pebbles; few fragments of glauconite; strongly acid; diffuse, wavy boundary.

B24t—68 to 75 inches, red (2.5YR 4/6) sandy loam, red (2.5YR 5/6) dry; weak, coarse, subangular blocky structure; hard, friable; few clay films; few, fine, iron-enriched pebbles; few fragments of glauconite; strongly acid; diffuse, wavy boundary.

C—75 to 90 inches, red (2.5YR 4/6) loamy fine sand; common streaks of reddish-yellow (5YR 6/6) and few lumps of dark-red (2.5YR 3/6) sandy loam; massive; brittle; few fragments of glauconitic sandstone; very strongly acid.

The solum is 60 to more than 100 inches thick. It ranges from 0 to about 10 percent iron-enriched pebbles.

The A horizon is 8 to 20 inches thick. It is reddish brown, yellowish red, dark brown, or brown and is strongly acid to slightly acid.

The Bt horizon is red, dark red, yellowish red, or strong brown. It is strongly acid to slightly acid sandy clay loam or sandy loam.

The C horizon is unconsolidated sandy and loamy materials that contain glauconitic sandstone. It is reddish or brownish and is strongly acid to very strongly acid.

Elrose fine sandy loam, 1 to 3 percent slopes (ElB).—This gently sloping soil is on uplands. It has a surface layer of brown fine sandy loam about 10 inches thick. The next layer, about 30 inches thick, is dark-red sandy clay loam. Below this is about 30 inches of yellowish-red sandy clay loam. The next layer is strong-brown sandy clay loam that is mottled with shades of red, yellow, and brown and extends to a depth of 80 inches.

Included with this soil in mapping are small areas of Alto and Trawick soils and small areas of loamy fine sand that have a red sandy loam subsoil. Trawick soils are on ridges and knolls.

Most of this Elrose fine sandy loam has been cleared of timber and cultivated in the past, but it is now used mostly for pasture. A small acreage is cultivated to truck crops, and the rest is in pine-hardwood forest. Capability unit IIe-1; pasture and hay group 8C; woodland group 3o1; Redland grazing group.

Elrose fine sandy loam, 3 to 8 percent slopes (ElD).—This gently sloping to sloping soil is on ridgetops and side slopes mainly along the contour above drainageways. It has the profile described as representative of the Elrose series.

Included with this soil in mapping are small areas of Bowie, Kirvin, Tenaha, and Trawick soils. Kirvin,

Tenaha, and Trawick soils are in the steeper areas and Bowie soils are on ridgetops.

Most areas of this Elrose fine sandy loam have been cleared of timber and cultivated in the past. Small areas are now used for truck crops, temporary pasture, and hay crops. Wooded areas are in pine-hardwood forests used mostly for pasture and timber production. The hazard of erosion is moderate where vegetation is sparse or the soil is left bare and runoff concentrates. Capability unit IIIe-4; pasture and hay group 8C; woodland group 3o1; Redland grazing group.

Elrose fine sandy loam, 8 to 12 percent slopes (EIE).—This strongly sloping soil is on hillsides and valley walls. It has a surface layer of reddish-brown, slightly acid fine sandy loam about 12 inches thick. Below this is yellowish-red sandy clay loam about 32 inches thick. The next layer is red sandy clay loam that extends to a depth of about 64 inches. The underlying material is stratified brownish sandy loam and loamy sand.

Included with this soil in mapping are small areas of Kirvin and Larue soils. Kirvin soils are on the upper edges of slopes, and Larue soils are on foot slopes.

Most areas of this Elrose fine sandy loam have been cleared and used for pasture. Wooded areas are used for pasture and timber production. The hazard of erosion is severe where vegetation is sparse or the soil is left bare and runoff concentrates. Capability unit VIe-1; pasture and hay group 8D; woodland group 3o1; Redland grazing group.

Eustis Series

The Eustis series consists of deep, gently sloping and gently rolling sandy soils on uplands. These soils formed in acid sandy sediment under a pine-hardwood forest.

In a representative profile the surface layer is brown, strongly acid fine sand about 7 inches thick. The next 14 inches is yellowish-brown, strongly acid fine sand. The next 36 inches is very strongly acid loamy fine sand. It is brown in the upper part and strong brown in the lower part. Below this is reddish-yellow, strongly acid loamy fine sand that reaches to a depth of 69 inches. The underlying material is very pale brown, very strongly acid fine sand that extends to a depth of 80 inches.

Eustis soils are somewhat excessively drained. Permeability is moderately rapid to rapid, and the available water capacity is low. Runoff is slow.

Representative profile of Eustis fine sand, 2 to 8 percent slopes, 10 miles north of Palestine on Farm Road 315, then 0.1 mile west on a county road, then 10 feet north of the road, in a wooded area:

A1—0 to 7 inches, brown (10YR 4/3) fine sand, light gray (10YR 7/2) dry; weak, fine, granular structure; loose, very friable; common fine and medium roots; strongly acid; gradual, smooth boundary.

A2—7 to 21 inches, yellowish-brown (10YR 5/4) fine sand, very pale brown (10YR 7/3) dry; single grained; loose, very friable; few fine roots; strongly acid; gradual, smooth boundary.

B1t—21 to 34 inches, brown (7.5YR 5/4) loamy fine sand, pink (7.5YR 8/4) dry; weak, medium, granular structure; loose, friable; few fine and medium roots; oxide and clay coating on many sand grains; very strongly acid; gradual, wavy boundary.

B21t—34 to 57 inches, strong-brown (7.5YR 5/6) loamy fine sand, reddish yellow (7.5YR 6/6) dry; moderate, medium, granular structure; loose, friable; few fine and medium roots; oxide and clay coating on sand grains and clay bridging between many sand grains; very strongly acid; gradual, wavy boundary.

B22t—57 to 69 inches, reddish-yellow (7.5YR 6/6) loamy fine sand, reddish yellow (7.5YR 7/6) dry; moderate, medium, granular structure; loose, friable; few fine and medium roots; oxide and clay coating on most sand grains and clay bridging between few sand grains; clean sand grains in some small pockets; strongly acid; gradual, wavy boundary.

C—69 to 80 inches, very pale brown (10YR 8/4) fine sand; single grained; loose, friable; dominantly clean sand grains; oxide and clay coating on sand grains in few small pockets; very strongly acid.

The solum is more than 60 inches thick. The A horizon is 16 to about 40 inches thick and is strongly acid to very strongly acid. The A1 horizon is brown or grayish brown. The A2 horizon is yellowish brown, strong brown, reddish brown, or yellowish red.

The Bt horizon is brown, strong brown, reddish yellow, yellowish red, or red. It is strongly acid to very strongly acid loamy sand or loamy fine sand. This horizon is 10 to 15 percent clay, which is at least 3 percent more clay than the A horizon. In some profiles the Bt horizon is in thin bands or lamellae of sandy loam or loamy sand that have a combined thickness of more than 6 inches within a depth of 80 inches.

The C horizon is very pale brown, pink, reddish yellow, or yellowish red. In some places it is mottled with shades of yellow, brown, and red.

Eustis fine sand, 2 to 8 percent slopes (EuD).—This gently sloping and gently rolling soil is in areas 5 to 230 acres in size.

Included with this soil in mapping are small areas of Arenosa and Darco soils. Arenosa soils are on ridges and knolls, and Darco soils are on side slopes.

Most of this Eustis fine sand has been cleared of timber and cultivated in the past, but is now in pasture. Many fields have been sodded or seeded to grass. Forested areas are used for timber production and pasture. The hazard of soil blowing is severe where vegetation is sparse or the soil is left bare. Capability unit IIIs-1; pasture and hay group 9B; woodland group 3s3; Sandy grazing group.

Ferris Series

The Ferris series consists of deep, sloping clayey soils on uplands. These soils formed in calcareous clayey sediment under tall grass.

In a representative profile the surface layer is dark grayish-brown, moderately alkaline clay 17 inches thick. The next layer is clay that is dark yellowish brown in the upper 10 inches and yellowish brown in the lower 15 inches. The underlying material is brownish-yellow, calcareous sandy loam that extends to a depth of about 60 inches.

Ferris soils are well drained. Permeability is very slow, and the available water capacity is high. Runoff is rapid. These are plastic soils that shrink or swell greatly with changes in moisture. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Ferris clay, 5 to 8 percent slopes, eroded, approximately 2 miles south of Bethel on Farm Road 2706 to Cayuga school, then 1.6 miles

west of Cayuga School on a county road and 0.75 mile west of corner of road, in an abandoned field:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (2.5Y 5/2) dry; moderate, coarse and medium, blocky structure; extremely hard, very firm; many strongly cemented concretions of calcium carbonate; hard ⅛-inch crust on surface when dry; calcareous; moderately alkaline; gradual, smooth boundary.

A1—6 to 17 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (2.5Y 5/2) dry; few, fine, faint mottles of dark yellowish brown and common dark-gray streaks; moderate, coarse, blocky structure parting to moderate, medium and fine, blocky; extremely hard, very firm; shiny surfaces on peds; common strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; diffuse, wavy boundary.

AC1—17 to 27 inches, dark yellowish-brown (10YR 4/4) clay, yellowish brown (10YR 5/4) dry; few faint mottles of yellowish brown; moderate, angular blocky structure; extremely hard, very firm; common parallelepipeds and intersecting slickensides; calcareous; moderately alkaline; diffuse, wavy boundary.

AC2—27 to 42 inches, yellowish-brown (10YR 5/6) clay, brownish yellow (10YR 6/6) dry; few, fine, light brownish-gray mottles in upper part becoming common in lower part; moderate, angular blocky structure; extremely hard, very firm; common intersecting slickensides; common strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline; clear, wavy boundary.

IIC—42 to 60 inches, brownish-yellow (10YR 6/6) sandy loam, yellow (10YR 7/6) dry; massive; slightly hard, very friable; calcareous; moderately alkaline; few weakly and strongly cemented masses of calcium carbonate.

The solum is 30 to 60 inches thick and is clay or silty clay. Throughout the solum are few to common concretions of calcium carbonate.

The A horizon is dark grayish brown, grayish brown, or olive gray. The A1 horizon is mottled in gray and brown. The AC horizon is dark yellowish brown, yellowish brown, olive brown, light olive brown, olive, or pale olive.

The C horizon is clay, shaly clay, sandy clay loam, or sandy loam.

Ferris clay, 5 to 8 percent slopes, eroded (FcD2).—This soil is in oblong to long and narrow areas that are 8 to about 80 acres in size. Slopes are convex and near 6 percent in most places. Gullies are common in all areas, and much of the topsoil has been eroded. Shallow gullies are 1 to 2 feet deep, 3 to 10 feet wide, and 30 to 60 feet apart. Deep gullies are 3 to 6 feet deep, 5 to 15 feet wide, and 100 to 150 feet apart.

Included with this soil in mapping are small areas of Heiden and Normangee soils. Heiden soils are in uneroded areas, and Normangee soils are near the top of slopes.

This Ferris clay is used mostly for pasture. A few fields have been seeded to grass. This soil is not suitable for cultivation. The hazard of erosion is severe where the soil is cultivated or vegetation is thin. Capability unit VIe-1; pasture and hay group 7A; woodland group 5c0; Blackland grazing group.

Freestone Series

The Freestone series consists of deep, nearly level to gently sloping loamy soils. These soils formed in alkaline clayey sediment under a hardwood forest that had an understory of tall grass.

In a representative profile the surface layer is slightly acid, dark grayish-brown fine sandy loam about 6 inches thick. The next 6 inches is brown fine sandy loam. The next 10 inches is strongly acid, yellowish-brown sandy clay loam that has light-gray and yellowish-red mottles. The next 24 inches is light-gray, strongly acid clay loam mottled with dark red. The next 26 inches is medium acid, mottled light brownish-gray and dark-red clay loam. Below this is light-gray clay mottled with brown, yellowish brown, and pale olive. The underlying material extends to a depth of 100 inches. It is moderately alkaline, light-gray and light olive-gray clay mottled with brown.

Freestone soils are somewhat poorly drained to moderately well drained. Permeability is slow, and the available water capacity is high. Runoff is very slow to medium.

Representative profile of Freestone fine sandy loam, 1 to 5 percent slopes, 9.8 miles west of Palestine on Farm Road 320, then 1.9 miles north by Farm Road 645 to county road, then 185 feet west of Farm Road 645 and 365 feet south of the county road, in a pasture:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; massive; hard, very friable; many fine roots; slightly acid; abrupt, smooth boundary.

A2—6 to 12 inches, brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; massive; hard, very friable; many fine roots; slightly acid; clear, wavy boundary.

B21t—12 to 22 inches, yellowish-brown (10YR 5/6) sandy clay loam; common light-gray (10YR 6/1) and yellowish-red (5YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; very hard, friable; many fine roots; many very fine pores; few thin clay films; few, fine, black and brown concretions of ferromanganese; strongly acid; clear, wavy boundary.

B22t—22 to 46 inches, light-gray (10YR 6/1) clay loam; many medium mottles of dark red (2.5YR 3/6) inside peds; compound moderate, coarse, prismatic structure parting to moderate, medium and fine, angular blocky; very hard, firm, sticky; common fine roots along faces of peds; few very fine pores; clean sand grains on faces of prisms; clay films on blocky peds; few, fine, black concretions of ferromanganese; strongly acid; diffuse, wavy boundary.

B23t—46 to 72 inches, prominently and coarsely mottled light brownish-gray (2.5Y 6/2) and dark-red (2.5YR 3/6) clay loam; few, fine, distinct, yellowish-brown mottles; moderate, fine and medium, blocky structure; very hard, firm, sticky; few roots along faces of peds; clay films on peds; few, fine, black concretions of ferromanganese; medium acid; diffuse, wavy boundary.

B3—72 to 90 inches, light-gray (5Y 7/1) clay; many, medium and coarse, distinct mottles of brown (10YR 5/3) and yellowish brown (10YR 5/4) and fine faint mottles of pale olive; weak blocky structure; extremely hard, very firm, sticky and plastic; few roots in cracks; few, soft, black masses of ferromanganese; neutral; diffuse, wavy boundary.

C—90 to 100 inches, faintly mottled light-gray (5Y 7/1) and light olive-gray (5Y 6/2) clay; common, medium, distinct, brown (10YR 5/3) mottles; very hard, firm; many, fine to coarse, soft masses of white calcium carbonate and few gypsum crystals; few black masses of ferromanganese; calcareous; moderately alkaline.

The solum is 60 to 100 inches thick. The A horizon is fine sandy loam or loamy fine sand that is 7 to 20 inches thick. The Ap or A1 horizon is dark grayish brown, dark brown, brown, pale brown, or grayish brown. Where it is dark brown

or dark grayish brown, the horizon is less than 7 inches thick. The A2 horizon is brown, pale brown, grayish brown, or light brownish gray.

The B21t horizon is yellowish brown, reddish yellow, or strong brown and has mottles of light gray, yellowish red, brown, and yellow. It is very strongly acid to medium acid and sandy clay loam or clay loam.

The B22t horizon is light gray, light brownish gray, or gray and has mottles of red, brownish yellow, strong brown, brown, or yellowish brown. This horizon is very strongly acid to medium acid clay loam, clay, or sandy clay. The B23t horizon is similar to the B22t horizon in color, but it is more strongly mottled. It is very strongly acid to medium acid clay loam, clay, or sandy clay.

The B3 horizon is gray and is mottled in shades of red, brown, and yellow. It ranges from medium acid to neutral.

The C horizon is clay, clay loam, or a stratified combination of clays and loams.

Freestone fine sandy loam, 0 to 1 percent slopes (FrA).—This nearly level soil is in areas 10 to 200 acres in size.

The surface layer is slightly acid, grayish-brown fine sandy loam about 17 inches thick. The next layer is strongly acid, yellowish-brown sandy clay loam that is mottled in shades of gray and red and extends to a depth of 36 inches. The next layer is very strongly acid, light-gray sandy clay loam that is mottled in shades of brown and red and extends to a depth of 48 inches. Below this layer is very strongly acid sandy clay that is mottled in shades of red, gray, and brown and extends to a depth of 72 inches. Mottled light-gray clay is below a depth of 72 inches.

Included with this soil in mapping are small areas of Lufkin and Galey soils. Lufkin soils are in low ponded areas, and Galey soils are on ridges and knolls.

Most areas of this Freestone soil are in pasture, but a few areas are in hardwood timber. A perched water table is at a depth of about 20 to 35 inches for short periods after heavy rains. Capability unit IIw-1; pasture and hay group 8C; woodland group 5o0; Sandy Loam grazing group.

Freestone fine sandy loam, 1 to 5 percent slopes (FrC).—This gently sloping soil is in areas 10 to 50 acres in size. It has the profile described as representative of the Freestone series.

Included with this soil in mapping are small areas of Axtell, Galey, and Lufkin soils. Axtell and Galey soils are on higher ridges and knolls, and Lufkin soils are in low areas.

About 85 percent of this Freestone soil has been cleared of timber and was cultivated at one time, but it is now mostly in pasture. Many fields have been seeded to improved grass. A small acreage is cultivated. Runoff is medium. The hazard of water erosion is moderate where runoff accumulates and vegetation is thin or has been removed. A perched water table is at a depth of about 24 to 50 inches during wet seasons. Capability unit IIIe-1; pasture and hay group 8C; woodland group 5o0; Sandy Loam grazing group.

Freestone-Lufkin complex (Fs).—This mapping unit is made up of nearly level soils in areas that are slightly lower than the surrounding soils. The surfaces are moundy and gently undulating. The overall slope is less than 0.5 percent. Freestone soils are on knolls and ridges and are 6 to 20 inches higher than the Lufkin soils. Freestone soils make up about 60 percent of the mapping unit, Lufkin soils 30 percent, and other soils the remaining 10 percent.

The Freestone soils have a brown, slightly acid loamy fine sand surface layer about 7 inches thick. Below this is strongly acid, brown fine sandy loam that extends to a depth of 18 inches. The next layer is 8 inches of very strongly acid sandy clay loam that is mottled with shades of yellow, gray, brown, and red. The next layer is 6 inches of light brownish-gray, strongly acid clay that is mottled with red and strong brown. Below this is medium acid clay that is strongly mottled with shades of gray, brown, and red and extends to a depth of 76 inches.

The Lufkin soils have a surface layer of fine sandy loam 7 inches thick. It is dark grayish brown and strongly acid in the upper part and grayish brown and medium acid in the lower part. The next layer is dark grayish-brown clay that has brown mottles and that extends to a depth of 40 inches. It is medium acid in the upper part and neutral in the lower part. The underlying material is neutral, mottled gray sandy clay.

Included with these soils in mapping are small areas of Stidham and Wilson soils. Stidham soils are near Freestone soils, and Wilson soils are near Lufkin soils.

Most areas of this mapping unit are in oak timber and are used for grazing. The soils are poorly drained to somewhat poorly drained. Freestone soils are slowly permeable, and Lufkin soils are very slowly permeable. Capability unit IIIw-2; pasture and hay group 8E; woodland group 5o0; Sandy Loam grazing group.

Fuquay Series

The Fuquay series consists of deep, nearly level to sloping sandy soils on uplands. These soils formed under a pine and hardwood forest.

In a representative profile the surface layer is grayish-brown, neutral loamy fine sand about 8 inches thick. Below this is 22 inches of light yellowish-brown, neutral loamy fine sand. The next 20 inches is very strongly acid, yellowish-brown sandy clay loam that has red and yellowish-red mottles. The next layer is 44 inches of very strongly acid sandy clay loam that is prominently mottled with shades of red, brown, yellow, and gray. The underlying material is weakly consolidated, red sandy clay loam and light-gray clay that extends to a depth of 106 inches and is very strongly acid.

Fuquay soils are well drained. Permeability is slow, and the available water capacity is low. Runoff is slow.

Representative profile of Fuquay loamy fine sand, 3 to 8 percent slopes, about 6 miles south of Palestine on Farm Road 322, then 50 feet east of road, in a Coastal bermudagrass pasture. This site is 2.75 miles north of the intersection of Farm Road 322 and State Highway 294:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) loamy fine sand; weak, medium, granular structure; soft, very friable; neutral; clear, smooth boundary.

A2—8 to 30 inches, light yellowish-brown (10YR 6/4) loamy fine sand; weak, medium, granular structure; soft, very friable; neutral; gradual, irregular boundary.

B21t—30 to 41 inches, yellowish-brown (10YR 5/6) sandy clay loam; few, medium, distinct mottles of yel-

lowish red (5YR 4/6); weak, medium, subangular blocky structure; hard, friable; very strongly acid; gradual, irregular boundary.

B22t—41 to 50 inches, yellowish-brown (10YR 5/8) sandy clay loam; common, coarse, prominent mottles of red (2.5YR 4/6); moderate, coarse, prismatic structure; very hard, friable; about 10 percent plinthite; very strongly acid; gradual, irregular boundary.

B23t—50 to 61 inches, prominently and coarsely mottled brownish-yellow (10YR 6/6) and red (10R 4/6) sandy clay loam; few, fine, faint mottles of light brownish gray; coating of light gray (10YR 7/2) on sand grains and peds; moderate, coarse, prismatic structure; very hard, friable; about 15 percent plinthite; very strongly acid; diffuse, irregular boundary.

B24t—61 to 94 inches, prominently and coarsely mottled red (10YR 4/6) and light-gray (10YR 7/1) sandy clay loam; few, medium, distinct mottles of brownish yellow (10YR 6/6); moderate, medium, prismatic structure; very hard, friable; about 15 percent plinthite; very strongly acid; diffuse, irregular boundary.

C—94 to 106 inches, weakly consolidated red (10YR 4/6) sandy clay loam and light-gray (10YR 7/2) clay; common, medium, distinct mottles of strong brown (7.5YR 5/8); massive; very hard, friable; very strongly acid.

The solum is more than 80 inches thick. The A horizon is 24 to 40 inches thick and is strongly acid to very strongly acid. In places it is slightly acid or neutral where it has been limed. The Ap or A1 horizon is dark grayish brown, grayish brown, brown, pale brown, or very pale brown. The A2 horizon is brown, pale brown, very pale brown, or light yellowish brown.

The Bt horizon is strongly acid to very strongly acid. The B21t and B22t horizons are brownish yellow, yellowish brown, light yellowish brown, or strong brown. They are mottled in shades of brown, gray, red, and yellow. The C horizon ranges from weakly consolidated loamy and clayey materials to sandy loam and loamy sand.

Fuquay loamy fine sand, 0 to 3 percent slopes (FuB).—This nearly level to gently sloping soil is on ridgetops and foot slopes.

It has a brown loamy fine sand surface layer 27 inches thick. The next layer is yellowish-brown, very strongly acid sandy clay loam that extends to a depth of 56 inches. The next layer extends to a depth of 95 inches and is very strongly acid sandy clay loam that is mottled with yellowish brown, yellowish red, and light yellowish brown. The next layer is strongly mottled light-gray, brownish-yellow, and dark-red sandy clay loam that extends to a depth of 112 inches.

Included with this soil in mapping are small areas of Bowie, Darco, Larue, and Leefield soils. Darco soils are on low ridges, Leefield soils on concave foot slopes, and Bowie and Larue soils in positions similar to the areas of Fuquay soils.

About 70 percent of this Fuquay soil has been cleared of timber and was cultivated in the past, but it is now mostly in pasture. A few fields are cultivated to truck crops (fig. 7). Grass planting for improved pasture is common (fig. 8). Capability unit IIIs-2; pasture and hay group 9A; woodland group 3s2; Sandy grazing group.

Fuquay loamy fine sand, 3 to 8 percent slopes (FuD).—This gently sloping to sloping soil is on side slopes in areas 10 to 450 acres in size. It has the profile described as representative of the Fuquay series. Slopes are both convex and concave.

Included with this soil in mapping are small areas of Darco and Bowie soils. Darco soils are on the points and tops of ridges, and Bowie soils are in positions similar to the Fuquay soil.

Most of this Fuquay soil has been cleared of timber and was cultivated at one time, but it is now used for pasture. A small acreage is cultivated. Timbered areas are in pine and hardwood. Capability unit IIIe-2; pasture and hay group 9A; woodland group 3s2; Sandy grazing group.

Galey Series

The Galey series consists of deep, nearly level to gently sloping loamy soils on terraces. These soils formed mostly under a hardwood forest in acid to alkaline sediment.

In a representative profile the surface layer is brown, slightly acid fine sandy loam about 6 inches thick. The next 5 inches is also brown slightly acid fine sandy loam. The next layer is medium to strongly acid sandy clay loam that reaches to a depth of 72 inches. It is yellowish brown in the upper 17 inches, red in the middle 40 inches, and yellowish red and yellowish brown in the lower 4 inches. It is mottled in shades of red, brown, yellow, and gray.

Galey soils are well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow.

Representative profile of Galey fine sandy loam, 0 to 3 percent slopes, 9 miles west of Palestine on Farm Road 320, then 1.0 mile south on Farm Road 645, then 1.2 miles southwest on county road and 600 feet south of the road, in a bermudagrass pasture:

Ap—0 to 6 inches, brown (10YR 5/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate, medium, granular structure; slightly hard, very friable; few iron concretions 3 to 7 millimeters in diameter; slightly acid; abrupt, smooth boundary.

A2—6 to 11 inches, brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/4) dry; massive; slightly hard, very friable; few iron concretions 3 to 7 millimeters in diameter; few worm casts of material from Ap horizon; slightly acid; clear, wavy boundary.

B21t—11 to 18 inches, yellowish-brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; weak, medium, subangular blocky structure; few thin clay films; hard, friable; medium acid; gradual, wavy boundary.

B22t—18 to 28 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, medium and coarse, prominent mottles of dark red (2.5YR 3/6); moderate, medium, subangular blocky structure; very hard, friable; few thin clay films; few fine concretions of ferromanganese; strongly acid; gradual, wavy boundary.

B23t—28 to 40 inches, mottled, red (10R 4/6) and yellowish-brown (10YR 5/6) sandy clay loam; few, fine, distinct mottles of very pale brown; moderate, fine and medium, subangular blocky structure; very hard, firm; few thin clay films; strongly acid; diffuse, wavy boundary.

B24t—40 to 52 inches, red (10R 4/6) sandy clay loam; common fine and medium mottles of yellowish brown (10YR 5/8); 15 percent of mass is light-gray (10YR 7/1) and white (10YR 8/1) coatings and streaks; moderate, fine and medium, subangular blocky structure; very hard, firm; few thin clay films; medium acid; diffuse, wavy boundary.

B25t—52 to 68 inches, red (2.5YR 4/6) sandy clay loam; common, medium and coarse, prominent mottles of

Figure 7.—**Peas on Fuquay loamy fine sand, 0 to 3 percent slopes.**

light gray (10YR 7/2) and light red (10R 6/8); weak, medium, subangular blocky structure; very hard, firm; medium acid; diffuse, wavy boundary.

B3—68 to 72 inches, mottled yellowish-red (5YR 4/6) and yellowish-brown (10YR 5/6) sandy clay loam; common streaks of light gray (10YR 7/2); weak, coarse, subangular blocky structure; very hard, friable; medium acid.

The A horizon is 7 to about 17 inches thick. It is dark grayish brown, grayish brown, brown, or pale brown and is medium acid to neutral.

The Bt horizons are medium acid to strongly acid sandy clay loam, clay loam, or fine sandy loam. The B21t and B22t horizons are yellowish brown, strong brown, brownish yellow, or yellow and are mottled in shades of brown and red. The lower B2t and B3 horizons are red and are mottled in shades of brown, gray, red, and yellow.

Galey fine sandy loam, 0 to 3 percent slopes (GaB).—This nearly level to gently sloping soil is in areas 5 to 100 acres in size.

Included with this soil in mapping are areas of Dougherty, Freestone, Konawa, and Lufkin soils. Dougherty, Freestone, and Konawa soils are in similar positions to the Galey soil. Lufkin soils are in swales or low areas. Areas of Galey soil that have slopes as much as 6 percent also are included.

Most of this Galey fine sandy loam is cultivated. Capability unit IIe-1; pasture and hay group 8C; woodland group 5o0; Sandy Loam grazing group.

Garner Series

The Garner series consists of deep, nearly level, clayey soils. These soils formed in alkaline clayey sediment under a hardwood forest and under tall grass in the open areas.

In a representative profile the surface layer is dark-gray, medium acid clay 5 inches thick. The next lower layer is light-gray, medium acid clay that extends to

Figure 8.—**Lovegrass pasture on Fuquay loamy fine sand, 0 to 3 percent slopes.**

a depth of 32 inches. Below this is gray, medium acid clay that is mottled with shades of brown and reaches to a depth of 60 inches. The underlying material is moderately alkaline, olive clay that extends to a depth of 82 inches.

Garner soils are poorly drained. Permeability is very slow, and the available water capacity is high. Runoff is slow. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Garner clay, approximately 2 miles south of Bethel on Farm Road 2706, then 1.6 mile west of Cayuga School on a county road, then 0.5 mile southwest of the road, in post oak woods:

A1—0 to 5 inches, dark-gray (10YR 4/1) clay; few, fine, faint, light-gray mottles; moderate, very fine, subangular blocky structure; very firm, very sticky and very plastic; medium acid; clear, smooth boundary.

AC1g—5 to 32 inches, light-gray (5Y 7/2) clay; common thin streaks of gray (10YR 5/1) that are apparently crack fill from the A1 horizon; moderate, fine, angular blocky structure; very firm, very sticky and very plastic; slickensides common in lower 10 inches; medium acid; gradual, wavy boundary.

AC2g—32 to 60 inches, gray (10YR 5/1) clay; common, fine, faint, grayish-brown and yellowish-brown mottles; weak, medium, blocky structure; very thin, very sticky and very plastic; many intersecting slickensides, common in upper part; few, fine, black stains and concretions of ferromanganese and few white streaks; medium acid; gradual, wavy boundary.

C—60 to 82 inches, olive (5Y 5/3) clay; common, fine, faint, light olive-brown mottles; calcareous; moderately alkaline.

The A horizon is very dark gray, dark gray, or gray. It has few to common, light-gray, yellowish-brown, or brown mottles that are faint to distinct and fine to medium. It is medium acid to mildly alkaline. The ACg horizon is gray to light gray and has common to many mottles of yellowish brown, reddish yellow, and red. It is medium acid to moderately alkaline. Intersecting slickensides and parallelepipeds are common at a depth of 20 to 30 inches.

The C horizon is gray, light gray, or olive and has few to many mottles of yellowish brown, yellow, pale yellow, and olive brown. It is slightly acid to moderately alkaline and is calcareous in some places.

Garner clay (Gc).—This nearly level soil is in areas 20 to 200 acres in size.

Included with this soil in mapping are small areas of Axtell, Burleson, Wilson, and Wrightsville soils. Axtell soils are on low ridges, and Burleson, Wilson, and Wrightsville soils are in low areas.

About 70 percent of this Garner clay is in hardwood timber, and it is used mostly for pasture or timber production. This clay soil is difficult to till. Water stands in low areas during wet spells. Capability unit IIIw-3; pasture and hay group 7A; woodland group 5c0; Blackland grazing group.

Hannahatchee Series

The Hannahatchee series consists of deep, nearly level soils. These soils formed under a hardwood and pine forest on the flood plains of streams that drain uplands high in glauconite.

In a representative profile the surface layer is dark-brown, slightly acid fine sandy loam about 7 inches thick. The next layer is dark-brown, neutral fine sandy loam 13 inches thick. Below this is 15 inches of dark reddish-brown, neutral sandy clay loam. The next layer is about 21 inches of yellowish-red, neutral sandy loam that has thin strata of very pale brown and light-brown loamy sand. The underlying material is mottled yellowish-brown, and light-gray, neutral sandy clay loam that extends to a depth of 80 inches.

Hannahatchee soils are well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow.

Representative profile of Hannahatchee fine sandy loam, approximately 4 miles southeast of the intersection of U.S. Highway 84 and Farm Road 323 in Palestine, then 1.33 miles south on a county road and 800 feet east of the road, in a bermudagrass pasture:

Ap—0 to 7 inches, dark-brown (7.5YR 4/4) fine sandy loam, light brown (7.5YR 6/4) dry; weak, medium, subangular blocky structure parting to weak, medium, granular; hard, friable; many fine roots; common pores; common worm casts; slightly acid; clear, smooth boundary.

B21—7 to 20 inches, dark-brown (7.5YR 4/4) fine sandy loam, strong brown (7.5YR 5/6) dry; few streaks of light-brown (7.5YR 6/4) loamy fine sand and fine distinct mottles of yellowish red; weak, medium, subangular blocky structure; hard, friable; few roots; few fine pores; neutral; gradual, wavy boundary.

B22—20 to 35 inches, dark reddish-brown (5YR 3/4) sandy clay loam, reddish brown (5YR 5/4) dry; moderate, medium, subangular blocky structure; very hard, firm; common fine and medium pores; neutral; clear, smooth boundary.

C1—35 to 56 inches, yellowish-red (5YR 4/6) sandy loam; many streaks and thin strata of light-brown (7.5YR 6/4) and very pale brown (10YR 7/4) loamy sand; massive; very hard, firm; common, weakly cemented, black concretions 1 to 2 millimeters in size; neutral; gradual, smooth boundary.

C2—56 to 80 inches, distinctly and coarsely mottled yellowish-brown (10YR 5/6) and reddish-brown (5YR 5/4) sandy clay loam; common, fine, light-gray mottles; massive; very hard, firm; many, weakly cemented, dark-brown and black concretions 1 to 2 millimeters in size; neutral.

The A horizon is 6 to 15 inches thick and is dark brown, brown, or reddish brown. It is medium acid to neutral.

The B horizon is brown, strong brown, dark reddish brown, or yellowish red and is mottled in shades of brown, yellow, or red in some places. It is medium acid to neutral.

The C horizon is yellowish red or yellowish brown and is mottled in shades of brown, yellow, red, or gray. This horizon has thin strata of loamy fine sand or loamy sand.

Hannahatchee fine sandy loam (Ha).—This soil is in long, narrow areas 5 to about 1,000 acres in size. It is covered at least once each year by shallow floodwater, but flooding lasts only a short time.

Included with this soil in mapping are small areas of Nahatche, Thenas, and Wehadkee soils.

About 50 percent of this Hannahatchee fine sandy loam has been cleared of timber and was cultivated at one time, but it is now used mostly for pasture. Many fields have been replanted to grass (fig. 9). This soil is not suitable for cultivation because of flooding. During wet seasons, it has a fluctuating water table at a depth of 30 to 50 inches. Capability unit Vw-1; pasture and hay group 2A; woodland group 1o7; Loamy Bottomland grazing group.

Heiden Series

The Heiden series consists of deep, gently sloping to sloping, well-drained clay soils. These soils formed in calcareous sediment under tall grass.

In a representative profile the surface layer is very dark grayish brown, calcareous clay about 18 inches thick. The next layer is dark grayish-brown, calcareous clay that has faint mottles of dark brown and reaches to a depth of 42 inches. Below this is yellowish-brown, calcareous clay that extends to a depth of 56 inches. A few calcium carbonate concretions are in all layers.

Heiden soils are well drained. Permeability is very slow, and the available water capacity is high. Runoff is rapid. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Heiden clay, 3 to 8 percent slopes, 0.8 mile southwest of Cayuga in an abandoned field, halfway between a ridge and a valley of gilgai microrelief:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; moderate, medium, blocky structure parting to moderate, fine, angular blocky; extremely hard, very firm; few roots; few, fine, strongly cemented concretions of calcium carbonate; few worm casts and small snail shells; calcareous; moderately alkaline; abrupt, wavy boundary.

A1—6 to 18 inches, very dark grayish-brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; moderate, fine, blocky structure; extremely hard, very firm; few worm casts and snail shells; few calcium carbonate concretions; calcareous; moderately alkaline; diffuse, wavy boundary.

AC—18 to 42 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; few, medium, faint mottles of dark brown (10YR 4/3); moderate, coarse to fine, angular blocky structure; extremely hard, very firm; many parallelepipeds and intersecting slickensides; few strongly cemented concretions of calcium carbonate; few vertical cracks containing material from A1 horizon; few very dark mottles in lower part; calcareous; moderately alkaline; diffuse, wavy boundary.

AC2—42 to 56 inches, yellowish-brown (10YR 5/4) clay, light yellowish brown (10YR 6/4) dry; moderate, coarse to fine, angular blocky structure; extremely hard, very firm; few parallelepipeds and slickensides in upper part of horizon; few strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

The solum is 40 to about 65 inches thick. The soil is dry

Figure 9.—**Lovegrass pasture near end of the growing season. The pasture was grazed heavily during winter and sprirng. The soil is Hannahatchee fine sandy loam.**

and cracked to a depth of more than 20 inches for as long as 90 to about 125 days most years. It is clay or silty clay throughout and has few to common calcium carbonate concretions.

The A horizon is very dark grayish brown, dark brown, or dark grayish brown. The AC horizon is dark gray, dark grayish brown, grayish brown, yellowish brown, olive, or olive brown. This horizon has many slickensides and parallelepipeds.

Heiden clay, 3 to 8 percent slopes (HeD).—This soil is in long and narrow to oblong areas 5 to about 70 acres in size. In most areas slopes face west.

Included with this soil in mapping are small areas of Axtell, Ferris, and Normangee soils. Axtell soils are along the upper edges of slopes, and Ferris soils are in eroded areas. Normangee soils are on narrow ridges.

Most of this Heiden clay has been cultivated in the past, but it is now in pasture. A few fields have been sodded to grass. The hazard of erosion is severe where the soil is left bare and runoff concentrates. Capability unit IVe-3; pasture and hay group 7A; woodland group 5c0; Blackland grazing group.

Kaufman Series

The Kaufman series consists of deep, nearly level, clayey soils on flood plains. These soils formed under a hardwood forest and under tall and mid grasses in the open areas.

In a representative profile the surface layer is black, alkaline clay about 38 inches thick. The next layer is very dark gray, alkaline clay that is faintly mottled with shades of olive and brown and extends to a depth of 60 inches. The underlying material is very dark gray, massive clay that extends to a depth of 72 inches.

Kaufman soils are somewhat poorly drained. Permeability is very slow, and the available water capacity is high. Runoff is slow. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Kaufman clay 1.3 miles west of Cayuga on U.S. Highway 287, then 2.6 miles south on a county road and 75 feet east of the road, in a pasture:

A11—0 to 8 inches, black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate, fine, subangular blocky and granular structure; extremely hard, very firm; many fine roots; mildly alkaline; gradual, smooth boundary.

A12—8 to 24 inches, black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate, coarse, blocky structure parting to fine, blocky; extremely hard, very firm; common fine roots; shiny pressure faces on some peds; few streaks of grayish brown; mildly alkaline; diffuse, wavy boundary.

A13—24 to 38 inches, black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; moderate, medium and fine, blocky structure; extremely hard, very firm; shiny pressure faces on surface of peds; common slickensides that do not intersect; mildly alkaline; diffuse, wavy boundary.

Bg—38 to 60 inches, very dark gray (2.5Y 3/0) clay, dark gray (2.5Y 4/0) dry; few, fine, faint mottles of light olive brown; weak and moderate, medium, blocky structure; extremely hard, very firm; common intersecting slickensides; common parallelepipeds that have the long axis tilted about 30 degrees from the horizontal; few concretions of calcium carbonate; mildly alkaline; diffuse, wavy boundary.

Cg—60 to 72 inches, very dark gray (2.5Y 3/0) clay; common, fine and medium, faint mottles of olive brown; massive; extremely hard, very firm; few slickensides; common very fine and fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum is 50 to 100 inches thick, is clay or silty clay, and is slightly acid to moderately alkaline.

The A horizon is 35 to 60 inches thick and is black or very dark gray. In most places it is mottled in the lower part with shades of yellow, brown, or olive.

The Bg and C horizons are gray to very dark gray.

Kaufman clay (Ka).—This soil is on flood plains that are protected from stream flooding by levees. Most areas are about 20 acres to a few thousand acres in size, and slopes are commonly less than 0.5 percent. Some areas are flooded by runoff from bordering uplands, but the shallow, slow-moving floodwater lasts only a short time. This soil has the profile described as representative of the Kaufman series.

Included with this soil in mapping are small areas of Trinity soils and areas of Kaufman soils that have an overwash of sandy clay loam or clay loam 10 to 24 inches thick. These overwash areas are on small deltas near the mouths of small streams and along foot slopes of adjoining uplands.

Most of this Kaufman clay has been cleared of timber and was cultivated in the past, but it is now used for pasture. A few fields are cultivated. Capability unit IIw-2; pasture and hay group 1A; woodland group 1w6; Clayey Bottomland grazing group.

Kaufman clay, frequently flooded (Kc).—This nearly level soil is on flood plains that are unprotected from flooding. Most areas are 30 acres to several thousand acres in size, and slopes are 0 to 1 percent. This soil is covered by shallow, slow-moving floodwater at least once each year. Flooding is usually during the spring and lasts 5 to 60 days.

The surface layer is black clay about 44 inches thick. The next layer is about 20 inches of very dark gray clay that has a few faint mottles. The underlying material is gray clay that extends to a depth of about 90 inches.

Included with this soil in mapping are small areas of Trinity soils and areas of Kaufman soils that have an overwash of clay loam and fine sandy loam 10 to 24 inches thick. These overwash areas are on small deltas near the mouths of small streams and along the foot slopes of adjoining uplands.

All of this Kaufman clay is used for pasture. It is not suitable for cultivation. Some hardwood timber is harvested from wooded areas. Capability unit Vw-2; pasture and hay group 1A; woodland group 1w6; Clayey Bottomland grazing group.

Kenney Series

The Kenney series consists of deep, gently sloping sandy soils on old stream terraces. These soils formed in unconsolidated loamy and sandy sediment under a hardwood forest.

In a representative profile the surface layer is dark-brown, slightly acid loamy fine sand 12 inches thick. The next 32 inches is yellowish-brown, slightly acid loamy fine sand. The next layer is strongly acid, yellowish-red sandy clay loam that extends to a depth of 72 inches. It is mottled in shades of red, brown, and yellow. The underlying material is strong-brown, thinly bedded loamy sand and sandy loam that is strongly acid and reaches to a depth of 90 inches.

Kenney soils are well drained. Permeability is moderately rapid, and the available water capacity is low. Runoff is very slow.

Representative profile of Kenney loamy fine sand, 1 to 5 percent slopes, about 9 miles west of Tennessee Colony on Farm Road 321, then about 0.25 mile west and 0.5 mile south of the termination of this road, in an abandoned field:

Ap—0 to 5 inches, dark-brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak, fine, granular structure; soft, very friable; many fine roots; slightly acid; clear, smooth boundary.

A1—5 to 12 inches, dark-brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; slightly hard, very friable; many fine roots; slightly acid; clear, wavy boundary.

A21—12 to 30 inches, yellowish-brown (10YR 5/4) loamy fine sand, very pale brown (10YR 7/4) dry; single grained; slightly hard, very friable; few fine roots; slightly acid; clear, wavy boundary.

A22—30 to 44 inches, yellowish-brown (10YR 5/6) loamy fine sand, yellow (10YR 7/6) dry; single grained; slightly hard, very friable; few fine roots; slightly acid; clear, wavy boundary.

B21t—44 to 52 inches, yellowish-red (5YR 5/8) sandy clay loam, reddish yellow (5YR 6/8) dry; common, medium, distinct mottles of brown (7.5YR 5/4) and red (2.5YR 4/6); weak, medium, subangular blocky structure; very hard, friable; few thin clay films; strongly acid; gradual, wavy boundary.

B22t—52 to 64 inches, yellowish-red (5YR 4/6) sandy clay loam, yellowish red (5YR 5/6) dry; common, medium, faint mottles of reddish yellow (5YR 6/6) and common, medium, distinct mottles of red (2.5YR 4/6); moderate, medium, subangular blocky structure; very hard, friable; few thin clay films; strongly acid; gradual, wavy boundary.

B23t—64 to 72 inches, yellowish-red (5YR 5/6) sandy clay loam, reddish yellow (5YR 6/8) dry; weak, coarse, subangular blocky structure; hard, friable; few thin clay films; strongly acid; diffuse, wavy boundary.

C—72 to 90 inches, strong-brown (7.5YR 5/6) thinly bedded loamy sand and sandy loam; massive; hard, very friable; strongly acid.

The solum is 65 to more than 100 inches thick. It is slightly acid to strongly acid.

The A horizon is 40 to 72 inches thick. The A1 or Ap

horizon is dark grayish brown, grayish brown, dark brown, or brown. The A2 horizon is brown, strong brown, or yellowish brown.

The Bt horizon is yellowish red, red, or reddish yellow and has mottles of contrasting shades of red, yellow, and brown. It is sandy loam, sandy clay loam, or clay loam.

Kenney loamy fine sand, 1 to 5 percent slopes (KeC).—This soil is in areas 5 to 125 acres in size. Slopes are mainly 0.5 to 2.5 percent and are plane to convex.

Included with this soil in mapping are small areas of Dougherty, Eustis, and Konawa soils. Dougherty and Eustis soils are on low ridges, and Konawa soils are in weakly convex areas.

Most of this Kenney loamy fine sand has been cleared of timber and was cultivated in the past, but it is now in pasture. A few fields are used for crops. Pine trees grow in some wooded areas. The hazard of soil blowing is moderate where this soil is left bare or vegetation is sparse. Capability unit IIIs-1; pasture and hay group 9B; woodland group 3s2; Sandy grazing group.

Kirvin Series

The Kirvin series consists of deep, gently sloping to moderately steep soils. These soils formed in acid, stratified loamy and clayey marine sediment under a pine and hardwood forest.

In a representative profile the surface layer is grayish-brown, medium acid fine sandy loam 6 inches thick. The next 6 inches is pale-brown, medium acid fine sandy loam. The next layer is 12 inches of yellowish-red, strongly acid clay. Below this is strongly acid clay loam that reaches to a depth of 44 inches and is mottled in shades of yellow, red, brown, and gray. The next layer is 6 inches of strong-brown, mottled clay loam. The underlying material is very strongly acid, stratified clay loam and loam that extends to a depth of 60 inches.

Kirvin soils are well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid.

Representative profile of Kirvin fine sandy loam, 3 to 8 percent slopes, 3 miles northeast of Neches on Farm Road 19 then 1.1 miles east on a county road and 0.75 mile south of the road, in a young plantation of loblolly pine:

Ap—0 to 6 inches, grayish-brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate, medium, granular structure; soft, very friable; few, irregularly shaped, ironstone pebbles, up to 15 millimeters in length; few ferruginous concretions, 2 to 7 millimeters in diameter; medium acid; clear, smooth boundary.

A2—6 to 12 inches, pale-brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; massive; very friable; ironstone pebbles and concretions as above; medium acid; clear, wavy boundary.

B21t—12 to 24 inches, yellowish-red (5YR 4/8) clay, yellowish red (5YR 5/8) dry; moderate, medium and fine, blocky structure; very hard, firm; few, fine, ferruginous concretions; common distinct clay films; strongly acid; gradual, wavy boundary.

B22t—24 to 36 inches, distinctly and coarsely mottled strong-brown (7.5YR 5/6), yellowish-red (5YR 4/6), and dark-red (10R 3/6) clay loam; moderate, medium, subangular blocky structure; very hard, firm; few thin clay films; strongly acid; gradual, wavy boundary.

B23t—36 to 44 inches, distinctly and coarsely mottled dark-red (2.5YR 3/6 and 10R 3/6) and strong-brown (7.5YR 5/6) clay loam; few, medium, distinct mottles of light gray (10YR 7/2); moderate, medium, subangular blocky structure; very hard, firm; strongly acid; diffuse, wavy boundary.

B24t—44 to 50 inches, strong-brown (7.5YR 5/6) clay loam; common, medium, distinct mottles of yellowish red (5YR 4/6) and light gray (10YR 7/2) and many, medium and coarse, prominent mottles of dark red (2.5YR 3/6); the light-gray part is clay; moderate, coarse, blocky structure; very hard, firm; few thin clay films; strongly acid; gradual, wavy boundary.

C—50 to 60 inches, stratified light-gray (5YR 7/1), yellowish-red (5YR 5/6), red (2.5YR 5/6), and strong-brown (7.5YR 5/6) clay loam and loam; extremely hard, very firm; very strongly acid.

The solum is 40 to 60 inches thick. The A horizon is 3 to 18 inches thick and is fine sandy loam, gravelly fine sandy loam, or loamy fine sand. It has a few to 35 percent coarse fragments of ironstone. The A1 or Ap horizon is brown, grayish brown, dark grayish brown, or pale brown. The A2 horizon is pale brown, light yellowish brown, brown, or light brown.

The Bt horizon is red, strong brown, dark reddish brown, yellowish red, or reddish brown, or is mottled in the lower part with shades of brown, red, yellow, and gray. It is strongly acid to very strongly acid. The B21t horizon is silty clay, clay, or clay loam. The B22t and B23t horizons are clay loam or clay. The B24t horizon is clay loam to sandy loam.

The C horizon is stratified and ranges from sandy loam or clay loam to platy shaly clay. Some strata in this horizon are weakly cemented.

Kirvin fine sandy loam, 3 to 8 percent slopes (KfD).—This gently sloping to sloping soil is on the tops of interstream divides and on the sides of small drainageways in areas 5 to 150 acres in size. This soil has the profile described as representative of the Kirvin series.

Included with this soil in mapping are small areas of less sloping Elrose soils on foot slopes.

About half of this Kirvin soil has been cleared and was cultivated at one time, but most of this has been sodded to grass and is now used for pasture. A few fields are cultivated. The rest is in pine and hardwood forest. Runoff is medium to rapid, and the hazard of erosion is moderate where water concentrates on bare or sparsely vegetated soil. Capability unit IVe-2; pasture and hay group 8C; woodland group 3o1; Sandy Loam grazing group.

Kirvin complex, 5 to 20 percent slopes (KlF).—This mapping unit is made up of sloping to moderately steep soils on the sides of large drainageways. Areas are 5 to about 250 acres in size. Kirvin gravelly fine sandy loam makes up about 60 percent of this mapping unit. A soil that is similar to Kirvin soil but is less than 40 inches over the underlying material makes up 30 percent, and other soils make up 10 percent. These soils are so intricately mixed that they cannot be shown separately at the scale mapped.

Kirvin soils have a surface layer of medium acid, brown gravelly fine sandy loam about 11 inches thick. It is about 25 percent ironstone and sandstone pebbles. The next layer extends to a depth of about 30 inches, is red, strongly acid clay, and is about 25 percent ironstone fragments. Below this is yellowish-red, strongly acid clay loam that extends to a depth of 50 inches. The underlying material is stratified, platy shaly clay that reaches to a depth of about 64 inches. It is red with mottles of brown and gray.

Included in this mapping unit are small areas of

Elrose soils on the top of ridges and on the more nearly level parts of slopes.

Most areas of this mapping unit are in hardwood and pine timber and are used for both pasture and timber production. A few areas have been cleared of timber and sodded to grass. Runoff is rapid. Capability unit VIe-1; pasture and hay group 8D; woodland group 4d2; Sandy Loam grazing group.

Kirvin complex, graded, 2 to 8 percent slopes (KmD).—This mapping unit is made up of soils in oval-shaped areas on knolls and ridges. Most areas are 5 to about 50 acres in size. The upper 12 to 24 inches of the solum has been removed and used for roadbuilding materials. This mapping unit is about 50 percent Kirvin soils, 40 percent a soil that is similar to Kirvin soil but less than 40 inches over the underlying material, and 10 percent other soils. These soils are so intricately mixed that they cannot be shown separately at the scale mapped.

Kirvin soils have a surface layer of gravelly clay loam about 3 inches thick. It is about 25 percent fine ironstone pebbles. The next layer is reddish-brown, strongly acid clay that is about 10 percent ironstone pebbles and extends to a depth of 24 inches. It is mottled with shades of red and brown in the lower 12 inches. Below this is a red, strongly acid clay loam that reaches to a depth of 40 inches. The underlying material is stratified ironstone, marly clay, and glauconite that extends to a depth of 60 inches.

Included in this mapping unit are small areas of Trawick soils.

All of this mapping unit is used for pasture or timber. Some areas have a thin stand of volunteer pine trees, and some areas have been planted to pine (fig. 10). A surface crust forms on these soils where they are bare or vegetation is sparse. Runoff is medium to rapid. The hazard of erosion is severe in most places until vegetation is well established. Capability unit VIe-1; pasture and hay group 8C; woodland group 4c2; Sandy Loam grazing group.

Kirvin-Sacul association, sloping (KnE).—This mapping unit is made up of soils on the sides of deeply cut drainageways. Most areas are long and narrow, follow the slope contours, and are about 10 to 900 acres in size. Slopes are 5 to 8 percent. Some small areas have sheet erosion and gullies. Kirvin soils make up about 45 percent of the mapping unit, Sacul soils about 25 percent, and other soils about 30 percent. These areas are larger, and their composition is more variable than for most other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

The Kirvin soils have a surface layer of fine sandy loam 7 inches thick. It is grayish brown in the upper part and pale brown in the lower part. The next layer is yellowish red, is strongly acid, and extends to a depth of 40 inches. It is clay loam in the upper part and silty clay in the lower part. The underlying material is very strongly acid, yellowish-red and light-gray clay that reaches to a depth of 60 inches.

The Sacul soils have a brown fine sandy loam surface layer about 7 inches thick. The next layer is about 22 inches of dark-red, strongly acid clay. Below this is light-gray silty clay that extends to a depth of 49 inches. It is strongly acid and mottled with yellowish brown and red. The underlying material is stratified, light-gray shaly clay and yellowish-brown sandy clay loam.

Included with these soils in mapping are areas of a soil similar to Kirvin soils but 20 to 40 inches over underlying material, as well as a soil similar to Sacul soils but more shallow over underlying material. Small areas of Bowie, Darco, and Fuquay soils on foot slopes and in narrow valleys are also included.

Most areas of this mapping unit are in pine and hardwood timber and are used for timber production and pasture. A few cleared areas are sodded to grass. These soils are moderately well drained to well drained. Runoff is rapid, and the hazard of erosion is severe where the surface is bare or vegetation sparse. Capability unit VIe-1; pasture and hay group 8D; woodland group 4c2; Sandy Loam grazing group.

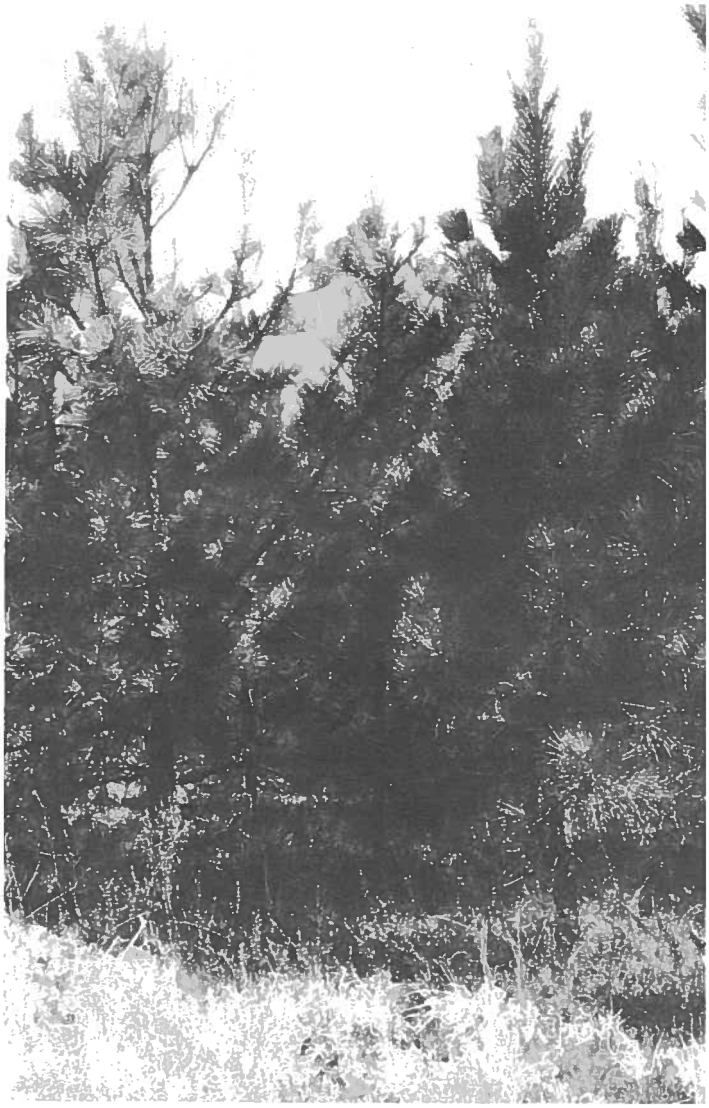

Figure 10.—**A 4-year-old planting of loblolly pine on Kirvin complex, graded, 2 to 8 percent slopes.**

Kirvin stony soils, 5 to 20 percent slopes (KrF).—These soils are on the sides of deeply cut drainageways. Most areas are long, follow the slope contours, and are about 10 to 500 acres in size.

Pebbles, stones, cobbles, and boulders cover 10 to 35 percent of the surface of these Kirvin soils and make up 15 to 35 percent of the surface layer. These soils have a medium acid fine sandy loam surface layer 10 inches thick that is 25 to 35 percent ironstone fragments. It is dark grayish brown in the upper part and light yellowish brown in the lower part. The next layer is about 32 inches of yellowish-red, strongly acid clay that is mottled with shades of brown. The underlying material is weakly cemented clay loam that has thin strata of sandy loam material and extends to a depth of 60 inches.

Included with these soils in mapping are small areas of Sacul soils along the crests and points of ridges and a few areas of Kirvin soils that have slopes of as much as 35 percent. Small areas of a soil similar to Kirvin soils except the depth to the underlying material is 20 to 40 inches make up 10 to 30 percent of the mapped areas.

Most areas of these Kirvin stony soils are in timber. A few small areas have been cleared of timber and sodded to grass, but these soils are not suitable for cultivation. Runoff is rapid. Capability unit VIs-1; pasture and hay group 8D; woodland group 4d2; Sandy Loam grazing group.

Konawa Series

The Konawa series consists of deep, gently sloping to sloping loamy soils. These soils formed in loamy sediment on old terraces under a hardwood forest and under tall grass in open areas.

In a representative profile the surface layer is dark-brown, medium acid fine sandy loam about 4 inches thick. The next 5 inches is brown, medium acid fine sandy loam. Below this is 3 inches of yellowish-red, strongly acid sandy clay loam. The next 22 inches is red, strongly acid sandy clay loam. The next layer is yellowish-red, strongly acid sandy loam 14 inches thick. The underlying material is strong-brown, medium acid loamy sand that extends to a depth of 60 inches.

Konawa soils are well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow to medium.

Representative profile of Konawa fine sandy loam, 2 to 5 percent slopes, 0.6 mile west of Cayuga on U.S. Highway 287, then 50 feet north, in a clearing:

A1—0 to 4 inches, dark-brown (10YR 4/3) fine sandy loam, yellowish brown (10YR 5/4) dry; weak, fine, granular structure; hard, very friable; few roots and worm casts; medium acid; clear, smooth boundary.

A2—4 to 9 inches, brown (7.5YR 5/4) fine sandy loam, light brown (7.5YR 6/4) dry; weak, fine, granular structure; hard, very friable; few roots and worm casts; medium acid; clear, smooth boundary.

B21t—9 to 12 inches, yellowish-red (5YR 5/6) sandy clay loam, reddish yellow (5YR 6/6) dry; weak, medium, subangular blocky structure; very hard, friable; few roots and worm casts; few worm casts and root channels filled with material from A2 horizon; few thin clay films; strongly acid; clear, smooth boundary.

B22t—12 to 22 inches, red (2.5YR 4/6) sandy clay loam; weak, coarse, prismatic structure parting to moderate, fine and medium, subangular blocky; very hard, very firm; few roots; few thin clay films; strongly acid; gradual, smooth boundary.

B23t—22 to 34 inches, red (2.5YR 5/8) sandy clay loam; weak, coarse, prismatic structure parting to weak, medium, subangular blocky; very hard, firm; few fine roots; few thin clay films; strongly acid; diffuse, smooth boundary.

B3—34 to 48 inches, yellowish-red (5YR 5/8) sandy loam, reddish yellow (5YR 6/8) dry; weak, coarse, prismatic structure; hard, friable; few roots; strongly acid; diffuse, smooth boundary.

C—48 to 60 inches, strong-brown (7.5YR 5/8) loamy sand, reddish yellow (7.5YR 6/8) dry; massive; loose; medium acid.

The solum is 48 to 72 inches or more thick. The A horizon is 7 to 20 inches thick and is brown, dark brown, grayish brown, or yellowish brown. It is slightly acid or medium acid.

The Bt horizon is red, reddish-brown, yellowish-red, or reddish-yellow sandy clay loam or fine sandy loam. The upper 20 inches is 18 to 27 percent clay. This horizon is medium acid or strongly acid. The B3 and C horizons are loamy sand or sandy loam. They are strong brown, yellowish red, or reddish yellow and strongly acid to neutral.

Konawa fine sandy loam, 2 to 5 percent slopes (KsC).—This gently sloping soil is on interstream divides and has convex slopes. Most areas are about 5 to 150 acres in size. This soil has the profile described as representative of the Konawa series.

Included with this soil in mapping are small areas of Axtell and Wrightsville soils. Both soils are in depressed areas.

Most areas of this Konawa soil have been cleared of timber and cultivated at one time but are now mostly in pasture. The rest is in hardwood timber and is grazed. Runoff is slow to medium, and the hazard of erosion is moderate where runoff accumulates on bare soil. Capability unit IIIe-4; pasture and hay group 8C; woodland group 5o0; Sandy Loam grazing group.

Konawa soils, 5 to 8 percent slopes, eroded (KtD2).—These sloping soils are on the sides of drainageways and the faces of escarpments in areas 5 to 240 acres in size. Slopes are mostly about 8 percent.

The surface layer is brown, medium acid fine sandy loam 7 inches thick. The next layer is red, strongly acid sandy clay loam about 42 inches thick. The underlying material is strong-brown, medium acid sandy loam that extends to a depth of 60 inches.

Most of the surface layer has been eroded and is missing in some spots, causing the surface layer to be sandy clay loam texture. Shallow gullies 1 to 2 feet deep, 5 to 10 feet wide, and 50 to 75 feet apart are in most areas.

Included with these soils in mapping are small areas of Axtell and Normangee soils. Axtell soils are in concave areas near the bottom of slopes. Normangee soils are on the points and crests of slopes.

All of these Konawa soils have been cleared of timber and cultivated at one time, but they are now used for pasture. A few areas have been sodded to improved grass. Runoff is medium, and the hazard of erosion is severe where the soil is left bare or vegetation is sparse. Capability unit IIIe-4; pasture and hay group 8C; woodland group 5o0; Sandy Loam grazing group.

Kullit Series

The Kullit series consists of deep, gently sloping loamy soils on uplands. These soils formed in loamy marine sediment under a pine-hardwood forest.

In a representative profile the surface layer is dark grayish-brown, medium acid fine sandy loam about 3 inches thick. The next 6 inches is pale-brown, medium acid fine sandy loam. The next layer is yellowish brown, is very strongly acid, and extends to a depth of 28 inches. It is loam in the upper part and clay loam in the lower part. The next layer is mottled clay loam that reaches to a depth of 36 inches. Below this is very strongly acid clay that is mottled in shades of yellow, red, brown, and gray and extends to a depth of 66 inches. The underlying material is very strongly acid, light-gray shaly clay.

Kullit soils are moderately well drained. Permeability is slow, and the available water capacity is high. Runoff is slow to medium.

Representative profile of Kullit fine sandy loam, 1 to 3 percent slopes, about 3.5 miles east of Denson Springs on U.S. Highway 294, then 4 miles north on a county road and 160 feet east of the road, in a pine forest 1.5 miles west of the Neches River.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak, granular structure; slightly hard, very friable; many fine roots; medium acid; clear, smooth boundary.

A2—3 to 9 inches, pale-brown (10YR 6/3) fine sandy loam, very pale brown (10YR 7/3) dry; moderate, medium, subangular blocky structure; slightly hard, very friable; many fine roots; many fine and very fine pores; few, small, rounded concretions of iron oxide; medium acid; clear, smooth boundary.

B21t—9 to 18 inches, yellowish-brown (10YR 5/6) loam, very pale brown (10YR 7/4) dry; weak, fine and medium, subangular blocky structure; hard, friable; common fine roots; common fine and very fine pores; few thin clay films; few, small, ironstone fragments; very strongly acid; gradual, smooth boundary.

B22t—18 to 28 inches, yellowish-brown (10YR 5/6) clay loam, yellow (2.5Y 7/6) dry; many, fine, distinct mottles of yellowish red (5YR 5/6) and red (2.5YR 4/6) and common mottles of light brownish gray (2.5Y 6/2); moderate, medium, blocky structure; hard, firm; few thin clay films; many ironstone fragments up to 1½ inches in diameter; very strongly acid; gradual, smooth boundary.

B23t—28 to 36 inches, mottled red (10R 4/6), yellowish-brown (10YR 5/6), and lesser amounts of light yellowish-brown (10YR 6/4) and light brownish-gray (2.5Y 6/2) clay loam; moderate, medium, blocky structure; very hard, very firm; few thin clay films; very strongly acid; gradual, irregular boundary.

B24t—36 to 48 inches, dark-red (10R 3/6) and red (2.5YR 4/6) clay; many distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4); moderate, fine and medium, blocky structure; very hard, very firm; few thin clay films; very strongly acid; gradual, irregular boundary.

B25t—48 to 66 inches, mottled dark-red (10R 3/6) and light-gray (10YR 6/1) clay; common streaks of strong brown; weak, medium, subangular blocky structure; extremely firm, extremely hard; few thin clay films; very strongly acid; gradual, irregular boundary.

C—66 to 85 inches, light-gray (10YR 6/1) shaly clay; 25 percent mottles of dark red (10R 3/6); few strong-brown streaks; few pockets of red sandy material containing mica flakes; very strongly acid.

The solum is more than 60 inches thick. The A horizon is 6 to 20 inches thick. The A1 horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is pale brown or light yellowish brown and is medium acid to strongly acid.

The upper part of the Bt horizon is yellowish-brown, strong-brown, and reddish-yellow loam or clay loam. It has common reddish mottles in the lower part. The lower part of the Bt horizon is clay or clay loam and is strongly acid to very strongly acid. It is mottled in shades of yellow, red, brown, and gray.

The C horizon is light-gray shaly clay and has dark-red and strong-brown mottles. It is very strongly acid.

Kullit fine sandy loam, 1 to 3 percent slopes (KuB).—This gently sloping soil is on uplands.

Included with this soil in mapping are small knolls and ridges of Bowie soils, small depressed areas of Lufkin soils, and areas of Susquehanna soils.

About 40 percent of this Kullit fine sandy loam has been cleared of timber and was cultivated at one time, but it is now mostly in pasture. A few fields are still cultivated. The rest is in pine-hardwood forest and is grazed. The hazard of erosion is moderate where water concentrates on bare or sparsely covered soil. Capability unit IIe-1; pasture and hay group 8C; woodland group 3w8; Sandy Loam grazing group.

Larue Series

The Larue series consists of deep, gently sloping to sloping sandy soils. These soils formed in sandy and loamy sediment under a pine and hardwood forest.

In a representative profile the surface layer is dark-brown, medium acid loamy fine sand about 8 inches thick. The next 18 inches is brown, medium acid loamy fine sand. Below this is 24 inches of yellowish-red, medium acid sandy clay loam that is mottled in the lower part. The next layer is 34 inches of reddish-yellow, mottled sandy clay loam.

Larue soils are well drained. Permeability is moderate, and the available water capacity is low. Runoff is slow.

Representative profile of Larue loamy fine sand, 3 to 8 percent slopes, 5.5 miles northwest of Palestine Country Club on a county road, then about 1,400 feet east of the road, between forks of Sixmile Branch, in a pasture.

Ap—0 to 8 inches, dark-brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; moderate, medium, granular structure; soft, friable; common roots; medium acid; abrupt, smooth boundary.

A2—8 to 26 inches, brown (7.5YR 5/4) loamy fine sand, light brown (7.5YR 6/4) dry; single grain; loose; few roots; few, fine and medium, iron-enriched concretions and soft masses; medium acid; gradual, smooth boundary.

B21t—26 to 36 inches, yellowish-red (5YR 4/6) sandy clay loam; moderate, medium, subangular blocky structure; hard, friable; few roots; common fine pores; few thin clay films on surface of peds; few, fine and medium, black concretions; medium acid; gradual, smooth boundary.

B22t—36 to 50 inches, yellowish-red (5YR 5/6) sandy clay loam; few, medium and coarse, distinct, dark-red (2.5YR 3/6) and few, medium, faint, reddish-yellow (5YR 6/6) mottles; moderate, medium, subangular blocky structure; hard, friable; common fine pores; few thin clay films on surface of some peds; medium acid; gradual, smooth boundary.

B23t—50 to 72 inches, reddish-yellow (5YR 6/6) sandy clay loam; common, medium, faint, red (2.5YR 4/6) and yellowish-red (5YR 4/6) mottles; weak, medium, subangular blocky structure; hard, friable; common fine pores; few thin clay films on surface of peds; medium acid; diffuse, smooth boundary.

B24t—72 to 84 inches, reddish-yellow (5YR 6/6) sandy clay loam; many, coarse, distinct, red (2.5YR 4/6) and faint yellowish-red (5YR 5/8) mottles and common streaks of yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) loamy sand; weak, coarse, subangular blocky structure; hard, friable; few, fine, black concretions; slightly acid.

The solum is 60 to 100 inches thick and is slightly acid to medium acid.

The A horizon is 20 to 34 inches thick. The A1 or Ap horizon is brown, dark brown, or pale brown. The A2 horizon is brown, strong brown, or light yellowish brown.

The Bt horizon is yellowish red, reddish yellow, or red and has mottles in shades of red, yellow, and brown.

Larue loamy fine sand, 1 to 3 percent slopes (LaB).—This gently sloping soil is on interstream divides in areas 5 to about 300 acres in size. Slopes are plane and convex.

The surface layer is loamy fine sand about 24 inches thick. It is brown in the upper part and strong brown in the lower part. The next layer is 52 inches of yellowish-red sandy clay loam that is mottled with dark red and yellowish brown in the lower part. Below this is yellowish-red, slightly acid sandy clay loam that is mottled in reddish brown and extends to a depth of 100 inches.

Included with this soil in mapping are small areas of Elrose and Fuquay soils and areas of a soil similar to Larue soil but redder throughout the profile. All of these soils are in the same relative position on the landscape.

About 60 percent of this Larue loamy fine sand has been cleared of timber and was cultivated at one time, but it is now mostly in pasture. A few fields are still cultivated. Wooded areas are used for pasture and timber production. Capability unit IIIs-2; pasture and hay group 9A; woodland group 3s2; Sandy grazing group.

Larue loamy fine sand, 3 to 8 percent slopes (LaD).—This gently sloping to sloping soil is on the sides of drainageways in areas 5 acres to 180 acres in size. A few deep gullies are in some areas. This soil has the profile described as representative of the Larue series.

Included with this soil in mapping are small areas of Fuquay, Kirvin, and Tenaha soils. Fuquay soils are in narrow, weakly concave areas, and Kirvin and Tenaha soils are steeper.

Most areas of this Larue soil have been cleared of timber and cultivated but are now mostly in pasture. The rest is in pine and hardwood forest and is grazed. Capability unit IIIe-2; pasture and hay group 9A; woodland group 3s2; Sandy grazing group.

Leefield Series

The Leefield series consists of deep, gently sloping, sandy soils on uplands. These soils formed under a pine and hardwood forest.

In a representative profile the surface layer is grayish-brown, medium acid loamy fine sand about 5 inches thick. The next 30 inches is loamy fine sand that is light brownish gray and medium acid in the upper 26 inches and very pale brown and strongly acid in the lower 4 inches. The next layer is 5 inches of yellowish-brown, very strongly acid sandy clay loam that is mottled with white and yellowish red. Below this is 25 inches of very strongly acid sandy clay loam that is mottled in shades of gray, brown, red, and yellow. The next layer is gray, very strongly acid sandy loam that is mottled with brownish yellow and gray and extends to a depth of 74 inches.

Leefield soils are somewhat poorly drained. Permeability is moderately slow, and the available water capacity is low. Runoff is slow.

Representative profile of Leefield loamy fine sand, 1 to 5 percent slopes, 4 miles south of Palestine on U.S. Highway 287, then 600 feet east, in a bermudagrass pasture:

Ap—0 to 5 inches, grayish-brown (10YR 5/2) loamy fine sand, light gray (10YR 7/2) dry; weak, granular structure; soft, very friable; many, fine and medium, fibrous roots; medium acid; clear, smooth boundary.

A21—5 to 31 inches, light brownish-gray (10YR 6/4) loamy fine sand, white (10YR 8/2) dry; few, fine, faint, pale-yellow mottles; single grained; soft, very friable; medium acid; gradual, wavy boundary.

A22—31 to 35 inches, very pale brown (10YR 7/4) loamy fine sand, very pale brown (10YR 8/4) dry; common distinct mottles of yellow (10YR 7/6); single grained; soft, very friable; many fine pores; strongly acid; gradual, wavy boundary.

B21t—35 to 40 inches, yellowish-brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; many prominent mottles of white (10YR 8/1) and few, medium, distinct mottles of yellowish red (5YR 5/6); weak, medium, subangular blocky structure; slightly hard, friable; clay coating on and clay bridging between sand grains; many fine and medium pores; very strongly acid; clear, smooth boundary.

B22t—40 to 56 inches, mottled gray (10YR 6/1), yellowish-brown (10YR 5/6), and dark-red (2.5YR 3/6) sandy clay loam; moderate, medium, subangular blocky structure; very hard, friable; few thin clay films; 15 to 20 percent plinthite; very strongly acid; gradual, smooth boundary.

B23t—56 to 65 inches, gray (10YR 6/1) sandy clay loam; common, medium, distinct mottles of brownish yellow (10YR 6/6) and few, coarse, prominent mottles of red (2.5YR 4/6); few medium pockets of gray (10YR 5/1) sandy material; red mottles are plinthite; moderate, medium, subangular blocky structure; very hard, friable; few thin clay films; common fine and medium pores; very strongly acid; gradual, smooth boundary.

B3—65 to 74 inches, gray (10YR 6/1) sandy loam; many, medium, distinct mottles of brownish yellow (10YR 6/6) and a few pockets of gray (10YR 5/1) sandy material; moderate, medium, subangular blocky structure; hard, very friable; clay coating on and clay bridging between sand grains; very strongly acid.

The solum is 60 to 100 inches thick and is very strongly acid except where it has been limed.

The A horizon is 20 to 40 inches thick. The A1 or Ap horizon is dark grayish brown, grayish brown, gray, or dark gray. The A2 horizon is light brownish gray, light gray, pale brown, or very pale brown.

The B2t horizon is yellowish brown, light yellowish brown, gray, or brownish yellow and is mottled with shades of brown, white, gray, yellow, and red. This horizon is sandy clay loam, sandy loam, or clay loam that is 5 to 15 percent plinthite.

Leefield loamy fine sand, 1 to 5 percent slopes (LeC).—This soil is in areas 5 to about 100 acres in size. Slopes are mostly concave.

Included with this soil in mapping are small areas of Fuquay and Pelham soils. Fuquay soils are on ridges or in other higher areas, and Pelham soils are in lower areas. Areas of Leefield soil that have slopes as much as 10 percent are also included.

About half of this Leefield loamy fine sand has been cleared of timber and was cultivated in the past, but it is now mostly used for pasture. The rest is in hardwood and pine forest and is grazed. This soil receives runoff from higher adjoining slopes and has a fluctuating water table at a depth of 2 to 5 feet during wet seasons. Capability unit IIIw-1; pasture and hay group 9C; woodland group 3w2; Sandy grazing group.

Lufkin Series

The Lukin series consists of deep, nearly level loamy soils. These soils formed in slightly acid to alkaline sediment under a hardwood forest and under tall grass in open areas.

In a representative profile the surface layer is strongly acid dark grayish brown fine sandy loam 2 inches thick. The next 5 inches is strongly acid grayish brown fine sandy loam. The next layer is strongly acid clay that extends to a depth of 38 inches. It is dark grayish brown in the upper part and grayish brown in the lower part. Below this is gray, slightly acid sandy clay that reaches to a depth of 58 inches. The underlying material is mildly alkaline, gray sandy clay that extends to a depth of 64 inches.

Lufkin soils are poorly drained to somewhat poorly drained. Permeability is very slow, and the available water capacity is high. Runoff is very slow. These are plastic soils that have high shrink-swell potential. Cracks form in the more clayey layers during the drier parts of the year.

Representative profile of Lufkin fine sandy loam, 0 to 1 percent slopes, 2.25 miles west of Tennessee Colony on Farm Road 321, then 2.25 miles south on a county road and 650 feet east of the road, in a wooded area:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak, medium, granular structure; hard, friable; common worm casts; common fine roots; strongly acid; clear, smooth boundary.

A2—2 to 7 inches, grayish-brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; few, fine, distinct, brownish-yellow and strong-brown mottles mainly along root channels; massive; hard, friable; many fine roots; common fine and medium pores; strongly acid; abrupt, wavy boundary.

B21tg—7 to 22 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; common, medium, faint mottles of brownish yellow (10YR 6/6); moderate, coarse, prismatic structure parting to moderate, medium and coarse, blocky; extremely hard, very firm; few roots; many clay films; vertical cracks about 2 centimeters wide extend through horizon; few slickensides that do not intersect; strongly acid; gradual, wavy boundary.

B22tg—22 to 38 inches, grayish-brown (10YR 5/2) clay, light brownish gray (10YR 6/2) dry; common, medium, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) mottles; few lenses of very fine sand in lower part; moderate, medium and coarse, blocky structure; extremely hard, very firm; few fine roots; fine pores; few small slickensides that do not intersect; cracks extend from B21tg horizon; strongly acid; gradual, wavy boundary.

B23tg—38 to 58 inches, gray (10YR 6/1) sandy clay; common, medium, distinct mottles of light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6); many lenses or pockets of very fine sand, silt, and sandy clay loam; weak, coarse, blocky structure; extremely hard, very firm; few fine roots; few thin clay films; few white crystals of neutral salts; few black concretions; slightly acid; diffuse, wavy boundary.

Cg—58 to 64 inches, gray (10YR 6/1) sandy clay, light gray (10YR 7/1) dry; common, medium, distinct mottles of brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6); massive; extremely hard, very firm; few white crystals of neutral salts; few ferromanganese concretions; mildly alkaline.

The solum is 40 to 60 inches thick. During most summer months, the soil cracks to a depth of more than 30 inches, and in most years the soil is saturated during winter and spring months.

The A horizon is 6 to 14 inches thick and is strongly acid to slightly acid. The A1 horizon is dark grayish brown, grayish brown, gray, or light brownish gray. The A2 horizon is grayish brown, gray, light gray, or light grayish brown.

The Btg horizon is dark grayish brown, dark gray, gray, grayish brown, or light brownish gray and has yellowish and brownish mottles. It is strongly acid to slightly acid in the upper part and strongly acid to mildly alkaline in the lower part.

The C horizon is grayish brown, light brownish gray, gray, or light gray.

Lufkin fine sandy loam, 0 to 1 percent slopes (LuA).—This soil is in areas 5 to about 450 acres in size. Slopes are plane and are mostly less than 0.5 percent.

Included with this soil in mapping are small areas of Axtell and Freestone soils on mounds and low ridges.

Most of this Lufkin fine sandy loam is in hardwood timber and is grazed. The rest is in open pasture. Capability unit IIIw-2; pasture and hay group 8E; woodland group 5w0; Tight Sandy Loam grazing group.

Nahatche Series

The Nahatche series consists of deep, nearly level loamy soils on flood plains of streams that drain forested uplands. These soils formed under a pine and hardwood forest.

In a representative profile the surface layer is brown, medium acid mottled clay loam about 8 inches thick. The next layer is 11 inches of dark grayish-brown, medium acid clay loam that has grayish-brown, brown, and yellowish-brown mottles. The next 10 inches is light brownish-gray, medium acid loam that has mottles of brown and grayish brown. The next layer is 20 inches of medium acid clay loam that has light brownish gray, gray, and strong-brown mottles. Below this is 10 inches of mottled, gray and strong-brown sandy clay loam. The underlying material is dark-gray, slightly acid clay loam that is distinctly mottled with strong brown and yellowish brown and extends to a depth of 83 inches.

Nahatche soils are somewhat poorly drained. Permeability is moderate, and the available water capacity is high. Runoff is slow.

Representative profile of Nahatche clay loam, in an area of Nahatche and Wehadkee soils, 1.75 miles west of Elkhart on State Highway 294, then 2.1 miles south-

west on a county road, then 150 feet north of the road and 20 feet south of the channel of Manson Creek, in a pasture:

A1—0 to 8 inches, brown (10YR 4/3) clay loam; few, fine, faint, dark grayish-brown and dark yellowish-brown mottles; weak, fine and medium, subangular blocky structure; very hard, firm; few fine roots; many worm casts; medium acid; clear, smooth boundary.

B21g—8 to 19 inches, dark grayish-brown (10YR 4/2) clay loam; few, fine, faint, grayish-brown and common, medium, faint, brown (10YR 5/3) and yellowish-brown (10YR 5/6) mottles; moderate, medium, granular structure; hard, friable; few fine roots; few fine pores; few brown concretions; medium acid; clear, smooth boundary.

B22g—19 to 29 inches, light brownish-gray (10YR 6/2) loam; many, coarse, distinct, brown (7.5YR 4/4) and common, medium, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; hard, friable; few fine roots; few fine pores; few, fine, brown concretions; medium acid; gradual, smooth boundary.

B23g—29 to 49 inches, mottled light brownish-gray (10YR 6/2), gray (10YR 6/1), and strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; hard, friable; few fine pores; few, fine, brown concretions; medium acid; gradual, wavy boundary.

B24g—49 to 59 inches, mottled gray (10YR 6/1) and strong-brown (7.5YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; hard, friable; few thin lenses of sandy material; few brown concretions; medium acid; clear, wavy boundary.

Abg—59 to 83 inches, dark-gray (10YR 4/1) clay loam; many, medium and coarse, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/8) mottles; weak, coarse, blocky structure; extremely hard, very firm; few, fine, brown concretions; slightly acid.

The solum is more than 50 inches thick. It is medium acid to neutral clay loam, sandy clay loam, silty clay loam, or loam.

The A horizon is 4 to 10 inches thick. It is grayish brown, brown, dark brown, or dark grayish brown.

The B21g horizon is dark grayish brown or grayish brown and is mottled in shades of brown or yellow. The B22g horizon is dark grayish brown, grayish brown, gray, or light gray. The B23g and B24g horizons are mottled in shades of gray and brown. The B22g, B23g, and B24g horizons have common thin strata of sandy material. Buried horizons are common at a depth of 40 inches or more.

Nahatche and Wehadkee soils (Na).—This mapping unit is made up of nearly level soils on the flood plains of both small and large streams. Most areas are 10 acres to several thousand acres in size. These soils are covered more than once each year by shallow, slow-moving floodwater. Flooding lasts only a short time on Nahatche soils, but some areas of Wehadkee soils are inundated for 3 to 4 months during the spring of most years.

About 70 percent of this mapping unit is Nahatche soils, 20 percent is Wehadkee soils, and 10 percent is other soils and marsh. Some delineations on the map contain both Nahatche and Wehadkee soils; others may be all Nahatche soils or all Wehadkee soils. These delineations are much larger and their composition is more variable than for most other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

The Nahatche and Wehadkee soils have the profile described as representative of the Nahatche and Wehadkee series, respectively.

Included with these soils in mapping are small areas of Robinsonville and Thenas soils. Robinsonville soils are on slightly higher ridges of the flood plain, and Thenas soils are in better drained areas along some of the small streams. Marsh is in shallow water areas that support a thick stand of plants, such as lilies, willow, watercress, fern, and sawgrass. Marsh has an upper layer 2 to 6 feet thick that consists of growing plant roots and stems as well as partly decomposed roots, leaves, and stems. Below this organic layer is loamy mineral soil material.

Most areas of this mapping unit are in hardwood timber and are used for both pasture and timber production. The soils are poorly drained to somewhat poorly drained. They are not suitable for cultivation because they are frequently flooded. A fluctuating water table is 1 to 4 feet below the surface of Nahatche soils and within 12 inches of the surface of Wehadkee soils. Capability unit VIw-1; pasture and hay group 2A; woodland group 1w6; Loamy Bottomland grazing group.

Nimrod Series

The Nimrod series consists of deep, nearly level to gently sloping sandy soils. These soils formed in medium acid to mildly alkaline loamy and clayey sediment under a hardwood forest and under tall grass in open areas.

In a representative profile the surface layer is slightly acid, grayish-brown loamy fine sand about 8 inches thick. The next 20 inches is brown, slightly acid loamy fine sand. The next layer is 8 inches of yellowish-brown, strongly acid clay loam that has light-gray and red mottles. Below this is 8 inches of strongly acid clay loam that has mottles of light brownish gray and strong brown. The next layer is 30 inches of strongly acid clay that is mottled in shades of red, yellow, brown, and gray. Below this is about 14 inches of medium acid, yellowish-red clay loam that is mottled with light gray and strong brown. The underlying material is yellowish-brown, slightly acid sandy clay loam that has brown and gray mottles and extends to a depth of 96 inches.

Nimrod soils are moderately well drained. Permeability is moderately slow, and the available water capacity is low. Runoff is slow.

Representative profile of Nimrod loamy fine sand, 0 to 3 percent slopes, 3 miles north of Cayuga on Farm Road 59, then 2.12 miles west on a county road to intersection with another county road, then 200 feet west and 400 feet north, in a pasture:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) loamy fine sand, light brownish gray (10YR 6/2) dry; moderate, medium, granular structure and weak, medium, subangular blocky; soft, very friable; slightly acid; clear, smooth boundary.

A2—8 to 28 inches, brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; single grained; slightly hard, very friable; common fine and medium pores; slightly acid; clear, wavy boundary.

B21t—28 to 36 inches, yellowish-brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; common, medium, distinct mottles of light gray (10YR 7/2) and few, medium, prominent mottles of red (2.5YR 4/6); moderate, medium, subangular blocky structure; very hard, friable; strongly acid; clear, wavy boundary.

B22t—36 to 44 inches, prominently and coarsely mottled red (2.5YR 4/6), light brownish-gray (10YR 6/2), and strong-brown (7.5YR 5/6) clay loam; moderate, coarse, prismatic structure parting to moderate, medium and fine, angular blocky; very hard, firm; clean sand grains on faces of prism; blocky peds have few thin clay films; strongly acid; gradual, wavy boundary.

B23t—44 to 64 inches, prominently and coarsely mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and dark-red (2.5YR 3/6) clay; moderate, medium and fine, blocky structure; extremely hard, very firm; few thin clay films; strongly acid; diffuse, wavy boundary.

B24t—64 to 74 inches, prominently and coarsely mottled dark-red (2.5YR 3/6) and light-gray (10YR 7/2) clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium and fine, blocky structure; extremely hard, very firm; few thin clay films; strongly acid; diffuse, wavy boundary.

B3—74 to 88 inches, yellowish-red (5YR 5/6) clay loam; many, medium and coarse, prominent mottles of light gray and common, medium, distinct mottles of strong brown (7.5YR 5/6); weak, blocky structure; few thin clay films; very hard, firm; medium acid; clear, smooth boundary.

C—88 to 96 inches, yellowish-brown (10YR 5/6) sandy clay loam; many, coarse, distinct mottles or streaks of strong brown (7.5YR 5/6) and light gray (10YR 7/2); massive; very hard, friable; slightly acid.

The solum is 50 to 88 inches thick. The A horizon is commonly 24 to 30 inches thick and is strongly acid to neutral. The A1 or Ap horizon is grayish brown, dark grayish brown, or brown. The A2 horizon is brown, pale brown, very pale brown, or light yellowish brown.

The B21t horizon is yellowish brown, brownish yellow, or light yellowish brown and is mottled in shades of gray and red. The upper part of the Bt horizon is sandy clay loam or clay loam that is 20 to 30 percent clay. The lower part of the B2t horizon is mottled in shades of gray, brown, and red. It is clay loam, sandy clay, or clay and is medium acid to strongly acid.

The C horizon is sandy clay loam to clay.

Nimrod loamy fine sand, 0 to 3 percent slopes (NdB).—This nearly level to gently sloping soil is in areas 5 to about 200 acres in size. Slopes are mainly 0.5 to 3 percent.

Included with this soil in mapping are small swales and potholes of Lufkin soils and low ridges and knolls of Galey and Stidham soils.

Most of this Nimrod loamy fine sand is in pasture. A small acreage is in wooded pasture, and a small amount is cultivated. Although the soil surface rapidly absorbs water, permeability is moderately slow. A perched water table is at the top of the Bt horizon after heavy rains and during wet seasons. Capability unit IIIs-2; pasture and hay group 9A; woodland group 5s0; Sandy grazing group.

Normangee Series

The Normangee series consists of deep, gently sloping to sloping loamy soils. These soils formed in alkaline clayey sediment on old terraces under a hardwood forest and under tall grass in open areas.

In a representative profile the surface layer is very dark grayish brown, slightly acid clay loam about 7 inches thick. The next layer is 11 inches of medium acid, dark-brown clay that is distinctly mottled in shades of yellow, red, gray, and brown. Below this is 16 inches of brown, neutral clay mottled in shades of olive, yellow, and brown. The next layer is light olive-brown, moderately alkaline clay that is mottled in shades of yellow, brown, and olive and extends to a depth of 44 inches. The underlying material is yellowish-brown, moderately alkaline, partly weathered shale that extends to a depth of 64 inches. It has distinct, fine mottles of brownish yellow and brown.

Normangee soils are moderately well drained to well drained. Permeability is very slow, and the available water capacity is high. Runoff is slow to rapid. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Normangee clay loam, 3 to 8 percent slopes, 2.25 miles west of Cayuga on U.S. Highway 287, then 2.6 miles northwest on a county road, in a pasture:

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; weak, medium, blocky structure; very hard, firm; few, dark, ferromanganese concretions and few, rounded, quartz pebbles; slightly acid; clear, wavy boundary.

B21t—7 to 18 inches, dark-brown (10YR 4/3) clay, brown (10YR 5/3) dry; few, fine, distinct mottles of yellowish brown (10YR 5/6), dark grayish brown (10YR 4/2), and reddish brown (5YR 4/4); moderate, medium, blocky structure; extremely hard, extremely firm; few, fine, ferromanganese concretions and quartz pebbles; distinct clay films on peds; medium acid; gradual, smooth boundary.

B22t—18 to 34 inches, brown (10YR 4/3) clay, brown (10YR 5/3) dry; few, fine, faint mottles of olive brown and yellowish brown; moderate, medium and fine, blocky structure; distinct clay films on peds; extremely hard, extremely firm; neutral; gradual, smooth boundary.

B23t—34 to 44 inches, light olive-brown (2.5Y 5/4) clay, light yellowish brown (2.5Y 6/4) dry; common, fine and medium, distinct mottles of yellowish brown (10YR 5/8) and olive yellow (2.5Y 6/8); weak, fine, angular blocky structure; extremely hard, extremely firm; few clay films; few, fine, soft lumps of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—44 to 64 inches, yellowish-brown (10YR 5/4) partially weathered shale, very pale brown (10YR 7/3) dry; few, fine, distinct mottles of brownish yellow and brown; extremely hard, very firm; common soft lumps of calcium carbonate up to 10 millimeters in size; calcareous; moderately alkaline.

The solum is 30 to 60 inches thick. The A horizon is 5 to 9 inches thick and is dark grayish brown, grayish brown, brown, dark brown, pale brown, or yellowish brown. It is medium acid to neutral.

The B21t horizon is dark brown, brown, reddish brown, or yellowish brown and has mottles of dark grayish brown, reddish brown, or light brown. It is medium acid to neutral. The B22t and B23t horizons are shades of brown, yellowish brown, or olive and have brownish, yellowish, or reddish mottles. They are slightly acid to moderately alkaline. The B23t horizon is calcareous in many places.

The C horizon is gray, olive-gray, olive, brown, or yellowish-brown shaly clay, clay loam, or clay. Below a depth of 30 inches, calcium carbonate concretions are few to common.

Normangee clay loam, 1 to 3 percent slopes (NoB).—This gently sloping soil is above terrace escarpments in areas that are mainly oblong and range from 5 to about 90 acres in size. Slopes are convex.

The surface layer is neutral clay loam about 6 inches thick. The next layer extends to a depth of 60 inches and is clay that is slightly acid in the upper part and mod-

erately alkaline in the lower part. It is dark brown in the upper 14 inches, dark grayish brown in the next 28 inches, and light olive brown in the lower 12 inches. It is mottled with shades of grayish brown, olive brown, and yellowish brown. The underlying material is yellowish-brown shaly clay that extends to a depth of 74 inches.

Included with this soil in mapping are small areas of Axtell and Konawa soils. The Axtell soils are on low ridges, and the Konawa soils are on crests of slopes.

Most of this Normangee clay loam has been cultivated, but it is now mostly in pasture. Some fields have been sodded to grass. Runoff is slow to medium, and the hazard of erosion is moderate where the soil is left bare or vegetation is thin. Capability unit IIIe-3; pasture and hay group 7H; woodland group 5c0; Tight Sandy Loam grazing group.

Normangee clay loam, 3 to 8 percent slopes (NoD).—This soil is on faces of the terrace escarpments and on the sides of drainageways in areas 5 to 90 acres in size. Some areas are eroded, and some have a few shallow gullies 1 to 2 feet deep and 5 to 12 feet wide. Slopes are convex. This soil has the profile described as representative of the Normangee series.

Included with this soil in mapping are small areas of Heiden and Konawa soils. Heiden soils are on the lower slopes and slope points. Konawa soils are steeper and are near the crest of slopes.

Most of this Normangee clay loam has been cultivated in the past, but most of it is now used for pasture. A small acreage is in timber. Runoff is rapid, and the hazard of erosion is severe where the soil is bare or vegetation is sparse. Capability unit VIe-3; pasture and hay group 7I; woodland group 5c0; Tight Sandy Loam grazing group.

Pelham Series

The Pelham series consists of deep, nearly level to gently sloping sandy soils. These soils formed in loamy and sandy sediment under a hardwood forest and water-tolerant grass.

In a representative profile the surface layer is dark grayish-brown medium acid to strongly acid loamy fine sand, about 15 inches thick, that is overlain with about 2 inches of partly decomposed plant material. The next 15 inches is light-gray, medium acid loamy fine sand. The next layer is very strongly acid sandy clay loam that extends to a depth of 60 inches. It is gray in the upper part and light gray in the lower part and mottled with shades of yellow, brown, and red. The next layer is very strongly acid sandy loam that is mottled in light gray, yellowish brown, and strong brown and extends to a depth of 68 inches.

Pelham soils are poorly drained. Permeability is moderate, and the available water capacity is low. Runoff is slow.

Representative profile of Pelham loamy fine sand, 0 to 5 percent slopes, 3.5 miles west of Montalba on Farm Road 321, then 600 feet south, in a pasture 1 mile west of the Providence Church.

O1—2 inches to 0 inches, grass roots, partly decomposed organic matter and 20 percent very dark gray fine sand; very strongly acid.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak, fine, granular structure; soft, very friable; many fine roots; common streaks of gray (10YR 6/1) and common, fine, distinct staining of yellowish brown (10YR 5/4) along root channels; strongly acid; gradual, irregular boundary.

A12—5 to 15 inches, dark grayish-brown (10YR 4/2) and light brownish-gray (10YR 6/2) loamy fine sand; common, fine, distinct staining of yellowish brown along root channels; massive; soft, very friable; many fine roots; medium acid; gradual, smooth boundary.

A2—15 to 30 inches, light-gray (10YR 7/2) loamy fine sand; common streaks of yellow (10YR 7/6); massive; soft, very friable; common fine pores and fine roots; medium acid; clear, smooth boundary.

B21tg—30 to 38 inches, gray (10YR 6/1) sandy clay loam; many, fine and medium, distinct mottles of strong brown (7.5YR 5/6) and yellowish red (5YR 5/6); moderate, medium, subangular blocky structure; very hard, friable; common clay films; very strongly acid; gradual, wavy boundary.

B22g—38 to 60 inches, light-gray (10YR 7/2) sandy clay loam; many, medium and coarse, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) and few, medium, prominent mottles of yellowish red (5YR 5/6); weak, medium, subangular blocky structure; very hard, friable; few thin clay films; very strongly acid; gradual, wavy boundary.

B3—60 to 68 inches, distinctly and coarsely mottled light-gray (10YR 7/2), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) sandy loam; weak, coarse, blocky structure; hard, friable; clay coating on and clay bridging between sand grains; very strongly acid.

The solum is more than 60 inches thick. An O horizon is in some areas. The A horizon is 22 to 40 inches thick and is very strongly acid except where it has been limed. The A1 horizon is dark grayish brown, dark gray, grayish brown, or gray. The A2 horizon is light gray, gray, or grayish brown and has faint yellow or yellowish-brown streaks in the lower part.

The Bt horizon is gray, light gray, or dark gray and has faint to distinct mottles in shades of gray, yellow, brown, and red. It is dominantly sandy clay loam and has streaks or pockets of sand, loamy sand, or sandy clay. This horizon is about 20 to 30 percent clay in the upper 20 inches.

Pelham loamy fine sand, 0 to 5 percent slopes (PeC).—This nearly level to gently sloping soil is on the deltas of small streams, on foot slopes, in valleys, and on the flats of sandy uplands. Most areas are oval to oblong and 5 to about 175 acres in size.

Included with this soil in mapping are small areas of Leefield soils on slightly higher ridges.

All of this Pelham loamy fine sand is used for pasture. A few fields have been drained and seeded to improved grass. This soil receives runoff and seepage from the higher adjoining slopes. A fluctuating water table is within 15 inches of the surface most of the year. Capability unit VIw-2; pasture and hay group 9C; woodland group 2w3; Flatwoods grazing group.

Robinsonville Series

The Robinsonville series consists of deep, nearly level, loamy alluvial soils. These soils formed on flood plains of streams that drain loamy and sandy uplands under a pine and hardwood forest.

In a representative profile the surface layer is brown, slightly acid fine sandy loam 9 inches thick. The next layer is 13 inches of yellowish-brown, slightly acid sandy loam. Below this is 8 inches of slightly acid, brown fine sandy loam. The next layer is 26 inches of stratified, slightly acid, pale-brown loamy fine sand and brown fine sandy loam. The next layer is neutral, brown fine sandy loam that extends to a depth of 86 inches and is thinly stratified with lenses and pockets of pale-brown loamy fine sand.

Robinsonville soils are well drained. Permeability is moderately rapid, and the available water capacity is high. Runoff is slow to medium.

Representative profile of Robinsonville fine sandy loam, 2.25 miles south of Cedar Creek Community on Farm Road 322, then 950 feet west of the road and 100 feet east of Cedar Creek, in a pasture:

A1—0 to 9 inches, brown (10YR 5/3) fine sandy loam; common thin strata and pockets of pale-brown (10YR 6/3) loamy fine sand; weak, medium, granular structure; hard, friable; slightly acid; clear, smooth boundary.

C1—9 to 22 inches, yellowish-brown (10YR 5/4) sandy loam; strata and pockets of dark-brown fine sandy loam; massive; hard, friable; slightly acid; clear, smooth boundary.

C2—22 to 30 inches, brown (10YR 5/3) fine sandy loam; few pockets and thin strata of pale-brown loamy fine sand and dark-brown (7.5YR 4/4) sandy loam; massive; hard, friable; slightly acid; clear, smooth boundary.

C3—30 to 56 inches, stratified pale-brown (10YR 6/3) loamy fine sand and brown (10YR 5/3) fine sandy loam; massive; slightly hard, very friable; slightly acid; gradual, smooth boundary.

C4—56 to 86 inches, brown (10YR 5/3) fine sandy loam; thin strata, pockets, and lenses of pale-brown (10YR 6/3) loamy fine sand; neutral.

The soil is slightly acid to neutral. The A horizon is about 5 to 15 inches thick. It is brown, grayish brown, dark brown, dark grayish brown, or yellowish brown.

The C horizon is brown, grayish-brown, or yellowish-brown fine sandy loam or sandy loam. This horizon has thin strata of loamy fine sand, fine sand, or sandy clay loam in most places. A buried A horizon is below a depth of about 20 inches in some places.

Robinsonville fine sandy loam (Ro).—This nearly level soil is in areas that are usually long and narrow and 5 to about 500 acres in size. Slopes range from 0 to 1 percent. This soil is covered two or three times each year by shallow, slow-moving floodwater, but each flooding lasts a short time.

Included with this soil in mapping are small areas of Hannahatchee and Thenas soils and somewhat higher areas of a loamy fine sand. Thenas soils are in somewhat lower, more poorly drained areas near the stream channels. Hannahatchee soils are in positions similar to Robinsonville soils on flood plains.

This Robinsonville fine sandy loam is used for pasture and timber production. More than half of the acreage has been cleared of timber (fig. 11). Most cleared areas are now in pasture (fig. 12). A fluctuating water table is 4 to 6 feet below the surface. Capability unit Vw-1; pasture and hay group 2A; woodland group 1o7; Loamy Bottomland grazing group.

Sacul Series

The Sacul series consists of deep, gently sloping to sloping loamy soils. These soils formed in acid, stratified clayey and loamy marine sediment under a pine-hardwood forest.

In a representative profile the surface layer is dark grayish-brown, strongly acid fine sandy loam about 4 inches thick. The next 4 inches is brown, strongly acid fine sandy loam. Below this is very strongly acid clay that extends to a depth of 48 inches. It is dark red in the upper part and red mottled with shades of yellow, gray, and brown in the lower part. The next layer is very strongly acid light-gray clay that is mottled with shades of red, yellow, and brown and extends to a depth of 58 inches. The underlying material is very strongly acid shaly clay stratified with thin layers of sandy loam or clay loam that extends to a depth of 82 inches. It is light gray and is mottled in shades of red, gray, or brown.

Sacul soils are moderately well drained. Permeability is slow, and the available water capacity is high. Runoff is medium to rapid.

Representative profile of Sacul fine sandy loam, 1 to 5 percent slopes, 3.5 miles east of Denson Springs on State Highway 294, then 2.5 miles north on a county road and 150 feet north of the road, in a forest. This site is 1.5 miles west of the Neches River.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak, fine, granular structure and moderate, medium, subangular blocky; slightly hard, very friable; many fine worm casts; strongly acid; clear, smooth boundary.

A2—4 to 8 inches, brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak, fine, blocky structure and moderate, medium, subangular blocky; slightly hard, very friable; common fine and medium pores; few iron concretions and few ironstone pebbles up to 1 inch in diameter; strongly acid; abrupt, smooth boundary.

B21t—8 to 26 inches, dark-red (10R 3/6) clay, red (10R 4/6) dry; strong, medium to fine, blocky structure; very hard, very firm; very strongly acid; gradual, smooth boundary.

B22t—26 to 36 inches, red (10R 4/6) clay; common, fine and medium, yellowish-brown (10YR 5/8) mottles, many in the lower part, and few, fine, light-gray (10YR 7/2) mottles; moderate, fine to medium, blocky structure; very hard, very firm; very strongly acid; gradual, smooth boundary.

B23t—36 to 48 inches, red (10R 4/6) clay; many gray (10YR 5/1) and yellowish-brown (10YR 5/8) mottles; moderate, fine to medium, blocky structure; very hard, very firm; very strongly acid; gradual, smooth boundary.

B3—48 to 58 inches, light-gray (10YR 7/1) clay; many fine and medium mottles of red (10R 4/6) and few mottles of yellowish brown (10YR 5/8); moderate, fine to medium, blocky structure; and very hard, very firm; very strongly acid; gradual, smooth boundary.

C1—58 to 70 inches, light-gray (10YR 7/2) shaly clay; mottles of red (10R 4/6), and thin strata of reddish sandy loam or clay loam; very hard, very firm; very strongly acid; gradual, smooth boundary.

C2—70 to 82 inches, mottled light-gray (10YR 7/1), light brownish-gray (10YR 6/2) and grayish-brown (10YR 5/2) shaly clay; thin strata of reddish sandy loam; very strongly acid.

Figure 11.—**Bluestem and other native plants in an area of abandoned cropland on Robinsonville fine sandy loam.**

The solum is 40 to 72 inches thick and is strongly acid to very strongly acid. The A horizon is 5 to 9 inches thick. The A1 horizon is dark grayish brown or brown. The A2 horizon is brown or pale brown.

The B2t horizon is dark red, red, or yellowish red and has mottles of light gray, gray, red, or yellowish brown. It is clay or silty clay.

The C horizon is light gray and has mottles of red, yellow, gray, or brown. It is shaly clay that is stratified with sandy loam or sandy clay loam.

Sacul fine sandy loam, 1 to 5 percent slopes (SaC).—This soil is on ridgetops and side slopes in areas 5 to about 100 acres in size. Included in mapping are small slightly lower areas of Susquehanna soils and some eroded areas.

About one-third of this Sacul fine sandy loam has been cleared of timber and was cultivated at one time, but is now used for pasture. The rest is used for pasture and timber production. Runoff is medium, and the hazard of erosion is severe where the soil is bare or vegetation is sparse. Capability unit IVe-1; pasture and hay group 8A; woodland group 3c2; Tight Sandy Loam grazing group.

Stidham Series

The Stidham series consists of deep, gently sloping sandy soils on terraces. These soils formed under a hardwood forest and under tall grass in open areas.

In a representative profile the surface layer is brown, medium acid loamy fine sand about 10 inches thick. The next 16 inches is light yellowish-brown, medium acid loamy fine sand. The next layer is 32 inches of yellowish-brown, strongly acid sandy clay loam that is mottled with red in the lower part. The underlying material is yellowish-brown, strongly acid sandy clay loam that is mottled in shades of gray and red and extends to a depth of 72 inches.

Stidham soils are well drained. Permeability is moderate, and the available water capacity is low. Runoff is slow.

Representative profile of Stidham loamy fine sand, 1 to 5 percent slopes, 2.2 miles north of Tucker on Farm Road 645, then 300 feet east of the road, in an abandoned field:

Ap—0 to 10 inches, brown (10YR 5/3) loamy fine sand, very pale brown (10YR 7/3) dry; weak, fine, granular

Figure 12.—**Bermudagrass pasture overseeded with white Dutch clover and ryegrass on Robinsonville fine sandy loam.**

structure; soft, very friable; medium acid; abrupt, smooth boundary.

A2—10 to 26 inches, light yellowish-brown (10YR 6/4) loamy fine sand, very pale brown (10YR 8/4) dry; massive; soft, very friable; medium acid; clear, smooth boundary.

B21t—26 to 33 inches, yellowish-brown (10YR 5/6) sandy clay loam, brownish yellow (10YR 6/6) dry; weak, medium, subangular blocky structure; hard, friable; few thin clay films; strongly acid; gradual, smooth boundary.

B22t—33 to 58 inches, yellowish-brown (10YR 5/6) sandy clay loam, yellow (10YR 7/6) dry; few, very fine, prominent mottles of red (2.5YR 5/8); weak, medium, subangular blocky structure; very hard, friable; few thin clay films; strongly acid; diffuse, smooth boundary.

C—58 to 72 inches, yellowish-brown (10YR 5/6) sandy clay loam, very pale brown (10YR 7/4) dry; common, medium, distinct, light-gray (10YR 7/1) mottles and few, fine, prominent, red (2.5YR 5/8) mottles; massive; hard, firm; strongly acid.

The solum is 50 to 72 inches thick. It is medium acid to strongly acid.

The A horizon is 24 to 32 inches thick. The Ap or A1 horizon is brown or pale brown. The A2 horizon is light brown, light yellowish brown, or very pale brown.

The B2t horizon is yellowish brown, brown, or strong brown. The B21t horizon is sometimes mottled with yellow or very pale brown. The B22t horizon is prominently mottled in shades of gray, red, yellow, or brown.

The C horizon is sandy clay loam, fine sandy loam, or loamy fine sand. It is mottled in shades of brown, yellow, red, gray, or white and is strongly acid to neutral.

Stidham loamy fine sand, 1 to 5 percent slopes (SmC).—This soil is in areas 5 to 300 acres in size. Surfaces are billowy, and slopes are mostly 1 to 4 percent.

Included with this soil in mapping are small areas of Arenosa, Dougherty, Lufkin, and Nimrod soils. Arenosa and Dougherty soils are on the highest knolls and ridges, and Nimrod soils are on the low ridges. Lufkin soils are in the ponded areas between knolls and ridges.

Almost all areas of this Stidham loamy fine sand are used for pasture. A few areas are still in timber, and a small acreage is cultivated. Some fields have been sodded to improved grass. The hazard of erosion is moderate where water concentrates on bare or sparsely covered soil. Capability unit IIIe-2; pasture and hay group 9A; woodland group 5s0; Sandy grazing group.

Susquehanna Series

The Susquehanna series consists of deep, gently sloping to strongly sloping loamy soils. These soils formed in acid, clayey sediment under a pine and hardwood forest.

In a representative profile the surface layer is strongly acid fine sandy loam about 8 inches thick. It is dark gray in the upper part and light brownish gray in the lower part. The next layer is very strongly acid mottled clay that extends to a depth of 68 inches. It is yellowish red and mottled in shades of brown and gray in the upper 28 inches and mottled in shades of brown, yellow, gray, and red in the next 24 inches. The lower 8 inches is light brownish gray and mottled in shades of red, brown, and yellow. The underlying material is light brownish-gray clay and brown shale that is very strongly acid and reaches to a depth of 80 inches.

Susquehanna soils are somewhat poorly drained. Permeability is very slow, and the available water capacity is high. Runoff is medium to very rapid. These are plastic soils that have high shrink-swell potential. Cracks form in the more clayey layers during the drier parts of the year.

Representative profile of Susquehanna fine sandy loam, 1 to 5 percent slopes, 4 miles northwest of intersection of Texas Highway 19 and U.S. Highway 287 in Palestine on U.S. Highway 287, then 2 miles north-northwest on a county road and 50 feet north of road:

A1—0 to 3 inches, dark-gray (10YR 4/1) fine sandy loam, gray (10YR 6/1) dry; moderate, fine, granular structure; slightly hard, friable; strongly acid; abrupt, smooth boundary.

A2—3 to 8 inches, light brownish-gray (10YR 6/2) fine sandy loam, white (10YR 8/2) dry; weak, medium, subangular blocky structure; hard, friable; strongly acid; abrupt, smooth boundary.

B21t—8 to 36 inches, yellowish-red (5YR 4/6) clay; many (25 to 30 percent of mass) prominent mottles of light brownish gray (10YR 6/2); strong, fine and medium, angular blocky structure; very hard, very firm; shiny grooved surfaces on peds; few thin clay films; root channels and cracks have some material from the A1 and the A2 horizons to a depth of 25 inches; very strongly acid; gradual, smooth boundary.

B22t—36 to 48 inches, mottled light brownish-gray (10YR 6/2) and yellowish-red (5YR 4/6) clay; strong, fine and medium, angular blocky structure; very hard, very firm; shiny grooved surfaces on peds; very strongly acid; diffuse, smooth boundary.

B23t—48 to 60 inches, mottled light brownish-gray (10YR 6/2) and red (2.5YR 4/8) clay; moderate, medium, angular blocky structure; very hard, very firm;

shiny grooved surfaces on peds; very strongly acid; diffuse, smooth boundary.

B24t—60 to 68 inches, light brownish-gray (10YR 6/2) clay; common coarse mottles of reddish-brown (2.5YR 5/4) and few fine streaks of brownish-yellow sandy loam; weak, coarse, blocky structure; very hard, very firm; few thin clay films; few shale fragments in lower part; very strongly acid; diffuse, wavy boundary.

C—68 to 80 inches, light brownish-gray (10YR 6/2) clay and brown (10YR 5/3) shale; some strong-brown (7.5YR 5/6) coatings on shale fragments; very strongly acid.

The solum is more than 60 inches thick. It is strongly acid to very strongly acid.

The A horizon is 5 to 10 inches thick. It is fine sandy loam, very fine sandy loam, or loam. The A1 horizon is dark grayish brown, grayish brown, or dark gray. The A2 horizon is light brownish gray, grayish brown, pale brown, yellowish brown, or light yellowish brown.

The Bt horizon is clay, silty clay, or clay loam. The upper part of the B2t horizon is reddish brown, yellowish red, or red and is mottled in shades of brown, gray, red, and yellow. The lower part of the Bt horizon is light brownish gray or gray and is mottled in shades of red, brown, or yellow.

The C horizon is clay or clay loam that is interbedded in places with shale and sandy material.

Susquehanna fine sandy loam, 1 to 5 percent slopes (SsC).—This gently sloping soil is on interstream divides and sides of drainageways in areas about 5 to 90 acres in size. It has the profile described as representative of the Susquehanna series.

Included with this soil in mapping are small areas of Kullit and Sacul soils. Kullit soils are in the concave parts of slopes, and Sacul soils are on the crest of slopes.

Most areas of this Susquehanna fine sandy loam are used for pasture. About half of the acreage has been cleared and cultivated. Many fields are now in improved pasture grass. Wooded areas are used for both pasture and timber production. Runoff is medium to rapid, and the hazard of erosion is severe where the soil is left bare or vegetation is sparse. Capability unit IVe-1; pasture and hay group 8A; woodland group 3c2; Tight Sandy Loam grazing group.

Susquehanna soils, 3 to 10 percent slopes, eroded (SuD2).—This unit is made up of Susquehanna soils and similar soils that are 40 to 60 inches deep. These gently sloping to strongly sloping soils are on the sides of drainageways in long, narrow areas about 5 to 200 acres in size. Many shallow gullies and a few deep gullies are in most areas. About half the surface soil has been washed away in some areas, and other areas are only slightly eroded.

The surface layer is strongly acid fine sandy loam about 8 inches thick. It is dark gray in the upper part and light brownish gray in the lower part. The next layer is very strongly acid clay that extends to a depth of 68 inches. It is reddish brown in the upper part and gray and mottled in the lower part. The underlying material is light brownish-gray clay and shale that reaches to a depth of 80 inches.

Included with these soils in mapping are small areas of Kirvin and Sacul soils. Both of these soils are on the crests and points of slopes.

These Susquehanna soils are used chiefly for pasture. About 40 percent is in pine and hardwood forest. These soils are not suitable for cultivation because the hazard of erosion is severe. Runoff is rapid. Capability unit VIe-1; pasture and hay group 8A; woodland group 3c2; Tight Sandy Loam grazing group.

Tenaha Series

The Tenaha series consists of moderately deep to deep, strongly sloping to moderately steep sandy soils. These soils formed in clayey and sandy marine sediment.

In a representative profile the surface layer is dark-brown, neutral loamy fine sand about 6 inches thick. The next 20 inches is light yellowish-brown, neutral loamy fine sand. Below this is about 6 inches of yellowish-red, very strongly acid sandy clay loam. The next layer is red and extends to a depth of 46 inches. It is very strongly acid sandy clay loam in the upper part and fine sandy loam in the lower part. The underlying material is stratified clay, sandy clay loam, sandy loam, and loamy sand. It is red, strong brown, and yellowish red.

Tenaha soils are well drained. Permeability is moderate, and the available water capacity is low. Runoff is slow.

These soils are mapped only in an undifferentiated unit with the Darco and Kirvin soils.

Representative profile of Tenaha loamy fine sand, 5 miles northeast of Palestine on State Highway 155, then 0.25 mile east on a cemetery road, then 660 feet south of a small cemetery, in a wooded area:

A1—0 to 6 inches, dark-brown (10YR 4/3) loamy fine sand; weak, medium, granular structure; loose, very friable; neutral; gradual, smooth boundary.

A2—6 to 26 inches, light yellowish-brown (10YR 6/4) loamy fine sand; single grained; loose, very friable; neutral; clear, smooth boundary.

B21t—26 to 32 inches, yellowish-red (5YR 5/6) sandy clay loam; common distinct streaks of strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; very hard, friable; common distinct clay films; very strongly acid; gradual, smooth boundary.

B22t—32 to 42 inches, red (2.5YR 5/6) sandy clay loam; common streaks of reddish yellow (7.5YR 6/8); weak, medium, subangular blocky structure; very hard, firm; very strongly acid; gradual, smooth boundary.

B3—42 to 46 inches, red (2.5YR 5/6) fine sandy loam; common streaks of strong brown (7.5YR 5/8); weak, coarse, subangular blocky structure; hard, friable; few pockets of clean sand grains; very strongly acid; clear, smooth boundary.

C—46 to 60 inches, stratified clay, sandy clay loam, sandy loam, and loamy sand in colors of red (2.5YR 5/6), yellowish red (5YR 5/6), and strong brown (7.5YR 5/8); very strongly acid.

The solum is 35 to 60 inches thick. The A horizon is 22 to about 40 inches thick. The A1 horizon is 4 to 8 inches thick and is very dark grayish brown, dark grayish brown, or dark brown. It is neutral to medium acid. The A2 horizon is pale brown or light yellowish brown.

The B2t horizon is yellowish red, yellowish brown, reddish yellow, red, or strong brown. It is strongly acid to very strongly acid.

Thenas Series

The Thenas series consists of deep, nearly level, loamy soils on flood plains. These soils formed under a pine and hardwood forest.

In a representative profile the surface layer is dark-

brown, slightly acid fine sandy loam 9 inches thick. The next layer is 14 inches of dark-brown, slightly acid fine sandy loam that is faintly mottled with grayish brown. Below this is 9 inches of medium acid fine sandy loam that is mottled in shades of brown and gray. The next layer is sandy clay loam that extends to a depth of 50 inches. It is medium acid, light yellowish brown, and mottled in shades of brown and gray in the upper part and slightly acid, yellowish brown, and mottled in shades of yellow, red, brown, and gray in the lower part. The next layer is dark brown, slightly acid clay loam that is about 12 inches thick and is mottled with light gray. The underlying material is mottled, stratified sandy clay loam that extends to a depth of 84 inches.

Thenas soils are moderately well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow.

Representative profile of Thenas fine sandy loam, 5.5 miles northwest of Palestine on State Highway 19, then 100 feet east of highway, in a meadow on the flood plain of Sixmile Branch:

A1—0 to 9 inches, dark-brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak, medium, granular and subangular blocky structure; hard, friable; slightly acid; gradual, smooth boundary.

B21—9 to 23 inches, dark-brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; few, medium, faint, grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; hard, friable; common fine and medium pores; slightly acid; clear, smooth boundary.

B22—23 to 32 inches, faintly and coarsely mottled brown (10YR 5/3) and dark-brown (10YR 3/3) fine sandy loam; common, medium, faint, pale-brown (10YR 6/3) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; hard, very friable; common medium and fine pores; few ferromanganese concretions 3 to 10 millimeters in diameter; medium acid; gradual, wavy boundary.

B23—32 to 44 inches, light yellowish-brown (10YR 6/4) sandy clay loam; many medium and coarse mottles of brown (7.5YR 4/2) and common, medium, faint, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; very hard, friable; few ferromanganese concretions; medium acid; gradual, wavy boundary.

B24—44 to 50 inches, yellowish-brown (10YR 5/4) sandy clay loam; many, medium, distinct, yellowish-red (5YR 5/6) mottles and common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine and medium, subangular blocky structure; very hard; few, fine, ferromanganese concretions; slightly acid; diffuse, wavy boundary.

B25—50 to 62 inches, dark-brown (10YR 4/3) clay loam; many, distinct, brown (7.5YR 4/4) and light-gray (10YR 7/1) mottles; moderate, medium, subangular blocky structure; very hard, firm; few, fine, ferromanganese concretions; slightly acid; diffuse, wavy boundary.

C—62 to 84 inches, mottled yellowish-brown (10YR 5/4), strong-brown (7.5YR 5/6), and light-gray (10YR 7/1) sandy clay loam; thin strata of sandy loam and loamy sand; massive; very hard; friable; slightly acid.

The solum is 50 to 80 inches thick. It is strongly acid to neutral.

The A horizon is dark grayish brown, grayish brown, pale brown, brown, dark brown, light yellowish brown, or yellowish brown.

The B horizon is fine sandy loam that has thin strata of loamy fine sand and clay loam. It is dark brown, brown, dark yellowish brown, light yellowish brown, or pale brown and is mottled in shades of gray, yellowish red, or brown.

Thenas fine sandy loam (Th).—This soil is in areas 5 to about 400 acres in size. Most areas are covered by shallow, slow-moving floodwater more than once each year, but each flooding lasts only a short time. The remaining areas are flooded at least once every 2 or 3 years. Slopes are 0 to 1 percent.

Included with this soil in mapping are small areas of Wehadkee soils in low parts of flood plains.

This Thenas fine sandy loam is not suitable for cultivation because it is frequently flooded. About 70 percent of it has been cleared of timber and is now used for pasture (fig. 13). Some fields have been sodded to improved grass, and some wooded areas are used for timber production. A water table is within 2 to 3 feet of the surface during winter and spring months. Capability unit Vw-1; pasture and hay group 2A; woodland group 1w8; Loamy Bottomland grazing group.

Trawick Series

The Trawick series consists of moderately deep to deep, gently sloping to moderately steep loamy soils. These soils formed under a cover of pine and hardwood forest in marine sediment rich in iron.

In a representative profile the surface layer is dark red, slightly acid fine sandy loam about 5 inches thick. The next layer is medium acid clay that extends to a depth of 46 inches. It is dark red in the upper part, strong brown in the lower part, and mottled in shades of red, yellow, and brown. Below this is 5 inches of mottled clay loam. The underlying material is strong-brown glauconitic material that extends to a depth of 59 inches and can be cut with a spade.

Trawick soils are well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is medium to rapid.

Representative profile of Trawick fine sandy loam, 2 to 8 percent slopes, 2.25 miles southeast of the courthouse in Palestine on U.S. Highway 84, then 0.3 mile north on Farm Road 1137 and 100 feet east of road, in an abandoned field:

Ap—0 to 5 inches, dark-red (2.5YR 3/6) fine sandy loam, red (2.5YR 4/6) dry; moderate, fine, subangular blocky and medium granular structure; hard, friable; common fine roots; 5 percent ironstone pebbles; many worm casts; slightly acid; clear, smooth boundary.

B21t—5 to 20 inches, dark-red (10R 3/6) clay, red (10R 4/6) dry; moderate, fine to medium, subangular blocky structure; very hard, friable; few roots and worm casts; 5 percent ferruginous pebbles; clay films on surface of peds are about one-half value darker than matrix; medium acid; diffuse, smooth boundary.

B22t—20 to 33 inches, dark-red (10R 3/6) clay, red (10R 4/6) dry; many, medium, distinct mottles of yellowish red (5YR 4/8); moderate, medium to coarse, prismatic structure and moderate, fine to medium, subangular blocky structure; very hard, friable; few roots; 5 percent ferruginous pebbles; common distinct clay films on ped surfaces; medium acid; diffuse, wavy boundary.

B23t—33 to 46 inches, strong-brown (7.5YR 5/6) clay; many, medium, distinct mottles of dark red (2.5YR 3/6) and yellowish red (5YR 4/6); moderate, medium prismatic structure parting to strong, fine, subangular blocky; very hard, friable; roots, peb-

Figure 13.—**Coastal bermudagrass pasture on Thenas fine sandy loam.**

bles, and clay films as described in the B21t horizon; medium acid; gradual, smooth boundary.

B3—46 to 51 inches, mottled strong-brown (7.5YR 5/6), yellowish-red (5YR 4/6), and dark-red (10R 3/6) clay loam; weak, coarse, prismatic and weak, thick, platy structure; very hard, very firm; common, weakly cemented, ironstone fragments and sandy glauconite shales; medium acid; gradual, smooth boundary.

C—51 to 59 inches, strong-brown (7.5YR 5/6) glauconite that can be cut with spade; massive; very hard; neutral.

The solum is 30 to 60 inches thick. The A horizon is dark red, red, or dark reddish brown. It is medium acid to neutral fine sandy loam, clay loam, or loam. This horizon is commonly 2 to 20 percent coarse fragments, but in gravelly phases it is as much as 50 percent coarse fragments.

The Bt horizon is strongly acid to medium acid clay or clay loam. It ranges from about 1 to 35 percent coarse fragments. This horizon is red or dark red in the upper part and strong brown, yellowish red, or light red in the lower part.

The C horizon is red or strong brown and is greensand marl or glauconite and interbedded layers of ironstone or ironstone conglomerate.

Trawick fine sandy loam, 2 to 8 percent slopes (TkD).—This gently sloping to sloping soil is on the top and sides of ridges in areas 5 to 1,800 acres in size. It has the profile described as representative of the Trawick series.

Included with this soil in mapping are small areas of Alto soils on ridgetops.

About 70 percent of this Trawick fine sandy loam has been cleared of timber and was cultivated at one time, but it is now used mostly for pasture. The remaining 30 percent is in pine-hardwood timber. A few small fields are still cultivated. Some pastures and fields have been planted to improved grass (fig. 14). Runoff is medium to rapid, and the hazard of erosion is moderate where the soil is left bare or vegetation is sparse. Capability unit IVe-4; pasture and hay group 8C; woodland group 3o1; Redland grazing group.

Trawick fine sandy loam, 8 to 20 percent slopes (TkF).—This sloping to moderately steep soil is on the sides of hills and drainageways in areas 5 to about 200 acres in size.

The surface layer is dark reddish-brown, slightly acid fine sandy loam 5 inches thick. The next layer is red, medium acid clay that reaches to a depth of 26 inches. Below this is 25 inches of strongly acid clay loam that is mottled in shades of red, yellow, brown, and

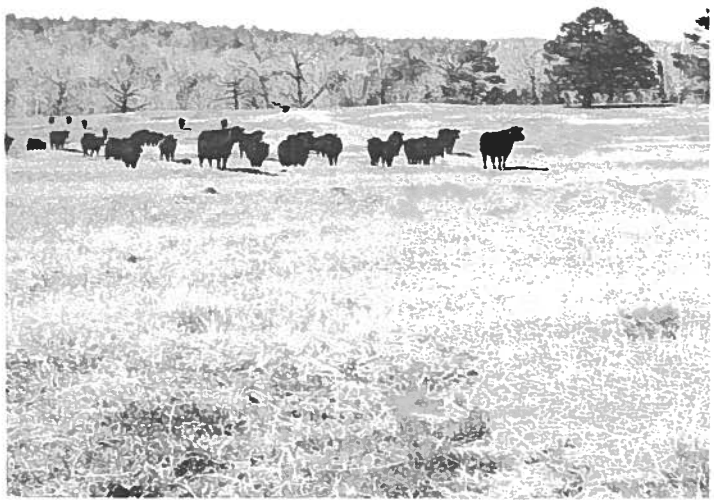

Figure 14.—**Coastal bermudagrass on Trawick fine sandy loam, 2 to 8 percent slopes.**

gray. The underlying material is thinly layered red marl that is strongly acid and extends to a depth of 59 inches. Included in mapping are soils that have some slopes up to 30 percent.

About half of this Trawick fine sandy loam has been cleared of timber and is used for pasture. The rest is in pine and hardwood timber. Runoff is rapid, and the hazard of erosion is severe where the soil is left bare or vegetation is sparse. Capability unit VIe-1; pasture and hay group 8D; woodland group 3o1; Redland grazing group.

Trawick and Bub soils, moderately steep (TmF).—This mapping unit is made up of gently sloping to moderately steep soils on the sides of hills and drainageways. Areas are 5 to about 700 acres in size, and slopes are mostly about 15 percent. In most areas this mapping unit is about 70 percent Trawick soils and 25 percent Bub soils. The percentage of Trawick soils ranges from 55 to 90 and that of the Bub soils from 10 to 40. Other soils make up the remaining 5 percent. These delineations are much larger and their composition is more variable than for most other mapping units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

These Trawick soils have a surface layer of dark reddish-brown, neutral clay loam that is 35 percent ironstone fragments and is 5 inches thick. The next layer extends to a depth of 34 inches and is red clay that is 15 to 35 percent ironstone pebbles and glauconite fragments. The underlying material is partially weathered, brittle, glauconite sandstone that extends to a depth of 44 inches. The Bub soils have the profile described as representative of the Bub series.

Included in this mapping unit are a few small areas of Elrose soils along foot slopes and some areas of soils that have slopes up to 30 percent.

Most areas of this mapping unit are in forest and are used for both timber production and pasture. A few areas have been cleared of timber and are used for pasture. Runoff is medium to rapid, and the hazard of erosion is severe. The available water capacity of the Trawick soils is high, and that of the Bub soils is low. Capability unit VIe-1; pasture and hay group 8D; woodland group 4r3; Redland grazing group.

Trep Series

The Trep series consists of deep, gently sloping sandy soils. These soils formed in acid marine sediment mainly under a pine and hardwood forest.

In a representative profile the surface layer is dark grayish-brown, medium acid loamy fine sand about 5 inches thick. The next 19 inches is pale-brown, medium acid loamy fine sand. The next layer is strongly acid, brownish-yellow sandy clay loam that has pale-red mottles and extends to a depth of 40 inches. The next layer is mottled with light brownish gray, yellowish brown, and dark red and extends to a depth of 74 inches. It is strongly acid sandy clay loam in the upper part and very strongly acid sandy clay in the lower part.

Trep soils are moderately well drained to well drained. Permeability is moderately slow, and the available water capacity is low. Runoff is slow.

Representative profile of Trep loamy fine sand, 1 to 5 percent slopes, about 1.75 miles south of Neches on a county road, then 100 feet east of the road, in a forested pasture 1.5 miles south of U.S. Highway 79:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak, fine, granular structure; slightly hard, very friable; few roots; medium acid; clear, smooth boundary.

A2—5 to 24 inches, pale-brown (10YR 6/3) loamy fine sand, very pale brown (10YR 7/3) dry; single grained; loose; few roots; medium acid; gradual, smooth boundary.

B21t—24 to 40 inches, brownish-yellow (10YR 6/6) sandy clay loam, yellow (10YR 7/6) dry; few, fine, prominent, pale-red mottles; weak, coarse and medium, subangular blocky structure; hard, friable; few roots; few fine pores; few clay films on faces of peds; strongly acid; gradual, smooth boundary.

B22t—40 to 48 inches, mottled light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and dark-red (2.5YR 3/6) sandy clay loam; moderate, medium, subangular blocky structure; hard, firm; few, brittle, red mottles; few fine pores; clay films on faces of peds; strongly acid; diffuse, wavy boundary.

B23t—48 to 74 inches, mottled yellowish-brown (10YR 5/8), dark-red (10R 3/6), and light brownish-gray (10YR 6/2) sandy clay; weak, medium, subangular blocky structure; very hard, very firm; clay films on faces of peds; few fine pores; very strongly acid.

The solum is more than 60 inches thick. The A horizon is 20 to 35 inches thick and is strongly acid to slightly acid. The A1 or Ap horizon is dark grayish brown, grayish brown, or brown. The A2 horizon is pale brown, brown, or light yellowish brown.

The B21t horizon is yellowish brown, light yellowish brown, or brownish yellow and has few fine to medium mottles in shades of red, yellow, or brown. It is medium acid to very strongly acid sandy clay loam or loam. The lower part of the Bt horizon is clav or sandy clay that is mottled in shades of yellow, brown, gray, or red and is strongly acid to very strongly acid.

Trep loamy fine sand, 1 to 5 percent slopes (TpC).—This soil is in areas 5 to about 200 acres in size.

Included with this soil in mapping are small areas of Fuquay, Lufkin, and Susquehanna soils. Lufkin soils are in ponded areas, and Fuquay and Susquehanna soils are on ridges and knolls. A few Trep soils that have slopes of less than 1 percent also are included.

Most of this Trep loamy fine sand has been cleared of timber and was cultivated in the past, but it is now used mainly for pasture. About 30 percent is in pine and hardwood forest. A few fields have been planted to trees. Capability unit IIIe-2; pasture and hay group 9A; woodland group 3s2; Sandy grazing group.

Trinity Series

The Trinity series consists of deep, nearly level clayey soils on flood plains. These soils formed under a hardwood forest and tall grass.

In a representative profile the surface layer is black, calcareous clay about 30 inches thick. The next layer is very dark gray, calcareous clay that is faintly mottled with dark grayish brown and reaches to a depth of 66 inches. The next layer is dark grayish-brown, calcareous clay that is faintly mottled in dark gray and yellowish brown and extends to a depth of 75 inches.

Trinity soils are somewhat poorly drained to moderately well drained. Permeability is very slow, and the available water capacity is high. Runoff is very slow. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Trinity clay, 1 mile north of the Trinity River crossing of U.S. Highway 287, in a pasture:

A11—0 to 5 inches, black (10YR 2/1) clay; moderate, fine, angular blocky structure; very firm, very sticky and very plastic; many worm casts; few old cracks filled with dark grayish-brown (10YR 4/2) sandy clay; calcareous; moderately alkaline; gradual, smooth boundary.

A12—5 to 30 inches, black (10YR 2/1) clay; strong, very fine, angular blocky structure; very firm, very sticky and very plastic; few slickensides in the lower 10 inches; calcareous; moderately alkaline; diffuse, wavy boundary.

A13—30 to 42 inches, very dark gray (10YR 3/1) clay; few, fine, faint mottles of dark grayish brown; strong, very fine, angular blocky structure; very firm, very sticky and very plastic; common intersecting slickensides and parallelepipeds; calcareous; moderately alkaline; diffuse, smooth boundary.

AC1—42 to 66 inches, very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; many, fine, faint mottles of dark grayish brown; moderate, fine and very fine. angular blocky structure; very firm, very sticky and plastic; calcareous; moderately alkaline; diffuse, smooth boundary.

AC2—66 to 75 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (10YR 5/2) dry; common, fine, faint mottles of dark gray and yellowish brown; few, fine, ferromanganese concretions; very firm, very sticky and plastic; calcareous; moderately alkaline.

The solum is 50 to 80 inches thick and is mildly alkaline to moderately alkaline clay.

The A horizon is black or very dark gray. It has olive and brownish mottles in some places.

The AC horizon is very dark gray, dark grayish brown, or gray and has faint to distinct mottles of grayish brown and olive. It has a few thin strata of loamy or sandy material in the lower part. Slickensides are common in most places between depths of 20 and 50 inches.

Trinity clay (Tr).—This soil is in areas 30 acres to several thousand acres in size. The soil is usually covered by shallow, slow-moving floodwater at least once each year except where it is protected by levees, but flooding lasts only a short time.

Included with this soil in mapping are small areas of Kaufman soils on lower parts of the flood plain.

Most areas of this Trinity clay are in hardwood timber and are used mainly for pasture. A few fields are cultivated to crops, and some wooded areas are used for hardwood timber production. This clayey soil is difficult to work. Flooding is a hazard if the soil is not protected by levees. Capability unit Vw-2; pasture and hay group 1A; woodland group 1w6; Clayey Bottomland grazing group.

Wehadkee Series

The Wehadkee series consists of deep, nearly level loamy soils on flood plains. These soils formed under a hardwood forest and under sedges in open areas.

In a representative profile the surface layer is grayish-brown, strongly acid sandy clay loam about 10 inches thick. The next layer is light brownish-gray, strongly acid sandy clay loam 18 inches thick. Below this is 30 inches of very strongly acid sandy clay loam. It is grayish brown and has strong-brown and reddish-brown mottles in the upper part, and it has strong-brown, grayish-brown, and reddish-brown mottles in the lower part. The underlying material is stratified clay loam and sandy clay loam that has gray and strong-brown mottles and extends to a depth of 72 inches.

Wehadkee soils are poorly drained. Permeability is moderate, and the available water capacity is high. Runoff is very slow.

These soils are mapped only in an undifferentiated unit with the Nahatche soils.

Representative profile of Wehadkee sandy clay loam, in an area of Nahatche and Wehadkee soils, 5.5 miles southeast of Cayuga on U.S. Highway 287, then 1.7 miles northeast of the Engling Wild Life Management Area headquarters on a county road, in a wooded area on the flood plain of Catfish Creek:

A1—0 to 10 inches, grayish-brown (10YR 5/2) sandy clay loam, light gray (10YR 7/2) dry; common, fine and medium, distinct mottles of strong brown (7.5YR 5/6) and yellowish red (5YR 5/6); moderate, medium, granular and weak, medium, subangular blocky structure; very hard, friable; common fine and medium pores; strongly acid; clear, smooth boundary.

B21g—10 to 28 inches, light brownish-gray (10YR 6/2) sandy clay loam, light gray (10YR 7/1) dry; common, faint and medium, distinct mottles of strong brown (7.5YR 5/6) and dark reddish brown (5YR 3/4); moderate, medium, subangular blocky structure; very hard, friable; few streaks of dark grayish brown (10YR 4/2) along root channels; common fine and medium pores; strongly acid; clear, smooth boundary.

B22g—28 to 48 inches, grayish-brown (10YR 5/2) sandy clay loam; common, fine and medium, distinct mottles of strong brown (7.5YR 5/6) and few, medium, prominent mottles of reddish brown (5YR 4/4); moderate, medium, subangular blocky structure; very hard, friable; common fine and medium pores; very strongly acid; clear, smooth boundary.

B23g—48 to 58 inches, distinctly and coarsely mottled

strong-brown (7.5YR 5/6) and grayish-brown (10YR 5/2) sandy clay loam; few, medium, distinct mottles of reddish brown (5YR 4/4); weak, medium, subangular blocky structure; very hard, friable; very strongly acid; gradual, smooth boundary.

C—58 to 72 inches, weakly stratified clay loam and sandy clay loam of gray (10YR 5/1) and strong brown (7.5YR 5/6); massive; very hard, friable.

The solum is 35 to 60 inches thick and is strongly acid to very strongly acid. It is fine sandy loam, loam, sandy clay loam, or silty clay loam.

The A horizon is dark grayish brown, grayish brown, light brownish gray, brown, or gray. In some places this horizon has common mottles in shades of brown and red.

The B horizon is gray, dark gray, grayish brown, or light brownish gray and has mottles in shades of gray or brown.

The C horizon is massive or has weak platy structure and is dominantly gray or light brownish gray.

Wilson Series

The Wilson series consists of deep, nearly level to gently sloping loamy soils on terraces. These soils formed under tall and mid grasses.

In a representative profile the surface layer is very dark gray, medium acid clay loam 6 inches thick. The next layer is black mottled in shades of yellow and brown and extends to a depth of 48 inches. It is medium acid silty clay and clay in the upper part and neutral clay in the lower part. Below this is 10 inches of very dark grayish brown, mildly alkaline clay. The underlying material is dark grayish-brown clay that extends to a depth of 108 inches.

Wilson soils are somewhat poorly drained. Permeability is very slow, and the available water capacity is high. Runoff is very slow to medium. These are plastic soils that have high shrink-swell potential. Deep, wide cracks form and are open for extended periods during the drier parts of the year.

Representative profile of Wilson clay loam, 0 to 3 percent slopes, about 0.7 mile west of Cayuga on U.S. Highway 287, then 1 mile south on a county road and 50 feet west of the road:

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay loam, gray (10YR 5/1) dry; massive; very hard, friable; hard crust on surface about ¼ inch thick; medium acid; abrupt, wavy boundary.

B21tg—6 to 24 inches, black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; few, faint, medium mottles of dark yellowish brown (10YR 3/4); moderate, medium and fine, angular blocky structure; extremely hard, very firm; thin distinct clay films; vertical cracks partly filled with material of same color as Ap horizon; medium acid; gradual, wavy boundary.

B22tg—24 to 34 inches, black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; common, distinct, medium mottles of dark yellowish brown (10YR 3/4); moderate, medium and fine, angular blocky structure; extremely hard, very firm; thin distinct clay films; vertical cracks partly filled with material of same color as B21tg horizon; medium acid; gradual, wavy boundary.

B23tg—34 to 48 inches, black (10YR 2/1) clay, dark gray (10YR 4/1) dry; common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium and coarse, angular blocky structure; extremely hard, very firm; thin distinct clay films; vertical cracks partially filled with material from B22tg horizon; neutral; diffuse, wavy boundary.

B3g—48 to 58 inches, very dark grayish brown (10YR 3/2) clay, grayish brown (10YR 5/2) dry; common, medium, distinct mottles of light olive brown (2.5Y 5/4); weak, coarse, blocky structure; extremely hard, very firm; few thin clay films; few, fine, rounded, black concretions; mildly alkaline; gradual, smooth boundary.

C1—58 to 80 inches, dark grayish-brown (2.5Y 4/2) clay, grayish brown (2.5Y 5/2) dry; many, medium, faint mottles of light olive brown (2.5Y 5/4); massive; extremely hard, very firm; few, fine, rounded, black concretions; mildly alkaline; diffuse, smooth boundary.

C2—80 to 108 inches, dark grayish-brown (10YR 4/2) clay, grayish brown (2.5Y 5/2) dry; common faint streaks of light yellowish brown (2.5Y 6/4); massive; extremely hard, very firm; few small concretions of calcium carbonate; noncalcareous; moderately alkaline.

The solum is 48 to 70 inches thick. Cracks extend to more than 30 inches below the top of the Bt horizon during summer months.

The A horizon ranges from dark gray or very dark gray to black.

The B2t horizon is black or very dark gray. It is medium acid to mildly alkaline clay, clay loam, or silty clay. This horizon has few to common mottles in shades of olive, yellow, and brown. The B3 horizon is dark gray or grayish brown and is neutral to moderately alkaline.

The C horizon is dark grayish brown, grayish brown, gray, or olive.

Wilson clay loam, 0 to 3 percent slopes (WlB).—This soil is in areas 5 to about 60 acres in size. Slopes are plane to convex.

Included with this soil in mapping are small areas of Axtell, Burleson, and Normangee soils. Axtell and Normangee soils are in slightly higher areas, and Burleson soils are in lower areas. Some areas that have several inches of overwash material from higher slopes also are included.

Most areas of this Wilson clay loam have been cultivated, but are now used for pasture or are idle. A perched water table is 1 to 4 feet below the surface during wet seasons. The hazard of erosion is moderate on gently sloping areas that are left bare or where vegetation is sparse. Capability unit IIIe-3; pasture and hay group 7H; woodland group 5c0; Blackland grazing group.

Wrightsville Series

The Wrightsville series consists of deep, nearly level, poorly drained loamy soils on old terraces. These soils formed under a hardwood forest in acid to alkaline clayey sediment.

In a representative profile the surface layer is strongly acid, dark grayish-brown clay loam about 5 inches thick. The next 7 inches is strongly acid, light brownish-gray silty clay loam. The next layer is mottled, very strongly acid silty clay that extends to a depth of 42 inches. It is grayish brown to a depth of 24 inches and light gray to a depth of 42 inches. Below this is grayish-brown clay that extends to a depth of 56 inches. The underlying material is grayish-brown, medium acid clay loam that extends to a depth of 74 inches.

Wrightsville soils are poorly drained. Permeability is slow, and the available water capacity is high. Runoff is slow.

Representative profile of Wrightsville clay loam, 1.6 miles west of Cayuga on U.S. Highway 287, then 0.95 mile north on a county road, in a wooded pasture:

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; common, distinct, medium and coarse mottles of light gray and common mottles of dark brown; weak, coarse, blocky structure; hard, friable; common, fine, ferromanganese concretions and stains; strongly acid; clear, wavy boundary.

A2—5 to 12 inches, light brownish-gray (10YR 6/2) silty clay loam, light gray (10YR 7/2) dry; weak, medium, blocky structure; hard, friable; common, fine, ferromanganese concretions and stains; common fine and medium pores; strongly acid; clear, wavy boundary.

B21tg—12 to 24 inches, grayish-brown (2.5Y 5/2) silty clay, light brownish gray (2.5Y 6/2) dry; common, medium, distinct mottles of yellowish brown (10YR 5/8) and common streaks as coatings of light-gray sandy material; moderate, medium, prismatic structure parting to moderate, medium, blocky; very hard, very firm; few thin clay films; very strongly acid; gradual, wavy boundary.

B22tg—24 to 42 inches, light-gray (2.5Y 7/2) silty clay, white (2.5Y 8/2) dry; common streaks of light brownish gray and few medium mottles of olive yellow (2.5Y 6/6) and pale olive (5Y 6/3); moderate, coarse, prismatic structure parting to moderate, coarse, blocky; very hard, very firm; very strongly acid; clear, wavy boundary.

B23tg—42 to 56 inches, grayish-brown (2.5Y 5/2) clay, light brownish gray (2.5Y 6/2) dry; very hard, very firm; few, fine, ferromanganese concretions; very strongly acid; gradual, wavy boundary.

C—56 to 74 inches, grayish-brown (10YR 5/2) clay loam, light brownish gray (10YR 6/2); dry; very hard, firm; medium acid.

The solum is 40 to 70 inches thick and is slightly acid to very strongly acid. The A horizon is 10 to 20 inches thick. The A1 horizon is dark grayish brown, grayish brown, gray, or dark gray. The A2 horizon is light brownish gray, grayish brown, or light gray.

The B horizon is grayish brown, light gray, gray, or light grayish brown and has few to common mottles in shades of brown, yellow, olive, or gray. This horizon is clay or silty clay. The B21tg and B22tg horizons have streaks and pockets of loamy material similar to those in the A2 horizon.

The C horizon is grayish brown or light gray. It is medium acid to moderately alkaline clay or clay loam.

Wrightsville clay loam (Wr).—This soil is in areas 5 to about 200 acres in size. Slopes are less than 0.5 percent.

Included with this soil in mapping are a few small areas of Axtell and Freestone soils. Both soils are on small ridges and knolls.

This Wrightsville clay loam is mostly in hardwood timber and is used for pasture. It is poorly suited to cultivation. A seasonal water table is 1 to 2 feet below the surface during wet seasons. Water is ponded in low areas during spring months (fig. 15). Capability unit IVw-1; pasture and hay group 8E; woodland group 5w0; Flatwoods grazing group.

Use and Management of the Soils

The major uses, limitations, and management needs of the soils of Anderson County are described in this section. The system of capability grouping used by the Soil Conservation Service is explained, and the management of the soils by capability units is described. Predicted yields of the principal crops are given. The management of soils for pasture and hay, for woodland, and as wildlife habitat is described. The properties and features that affect engineering practices are enumerated, mainly in tables.

Figure 15.—**Low areas of Wrightsville clay loam commonly ponded during wet season. Oak timber has been cut for fuel.**

Use of the Soils for Crops [2]

Controlling erosion and maintaining soil tilth and fertility are the main objectives in the management of soils in Anderson County. In more than half the county, the soils, if cultivated, are subject to accelerated erosion, and in most areas they have low fertility and poor tilth. Crop residue, cover crops or green-manure crops, and adequate fertilization are the chief management needs. Leaving a sufficient amount of crop residue on or near the soil surface helps to control erosion, conserve moisture, and maintain or improve soil tilth.

Such crops as small grain, sudangrass, cowpeas, and mixtures of annual grasses and legumes provide protective cover between cultivated crops. Crops in this county normally respond to fertilization. If proper amounts of fertilizer are applied and other good practices of soil management are used, soil fertility can be maintained. Information on soil testing and application of fertilizer can be obtained from the Soil Conservation Service or the Texas Agricultural Extension Service.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils

[2] JERRY J. WALLER, field specialist in agronomy, Soil Conservation Service, helped prepare this section.

are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pasture, forest trees, or engineering.

In the capability system, the kinds of soil are grouped at three levels, the class, subclass, and unit. These levels are defined in the following paragraphs. To find the capability unit of a specific soil, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I to VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife.

Class VI soils have limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture, woodland, or wildlife. (No class VII soils are in Anderson County.)

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (No class VIII soils are in Anderson County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils, the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States (not in this county), shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclasses symbol, for example, IIe-2 or IIIe-4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

CAPABILITY UNIT I-1

Alto loam, 0 to 1 percent slopes, is the only soil in this unit. This deep, moderately well drained soil has a loamy surface layer. Permeability is moderately slow, and the available water capacity is high.

This soil is well suited to corn and cotton and is suited to most other crops commonly grown in the area. In a suitable cropping system, corn is grown in rotation, and fertilizer is added to increase production and the amount of residue. Crop residue is left on or near the surface to control erosion, conserve moisture, and maintain or improve tilth.

CAPABILITY UNIT I-2

Bernaldo fine sandy loam, 0 to 1 percent slopes, is the only soil in this unit. This deep, nearly level loamy soil is well drained. Permeability is moderate, and the available water capacity is moderate.

Small areas of this soil are cultivated to corn and truck crops. In a suitable cropping system, corn is grown in rotation, and fertilizer is added to increase production and the amount of residue. Crop residue is left on or near the soil surface to control erosion, conserve moisture, and improve or maintain tilth.

CAPABILITY UNIT IIe-1

This unit consists of deep, nearly level to gently sloping loamy soils. These soils are moderately well drained to well drained, and their permeability is slow to moderate. The available water capacity is high.

Cowpeas and corn are the main crops. A large amount of residue from these crops should be left on or near the surface to protect the soil during heavy rains. The use of fertilizer increases the amount of residue. Terracing and contour farming help to control water erosion. Diversion terraces and grassed waterways are needed in some areas for protection against runoff.

CAPABILITY UNIT IIe-2

Alto fine sandy loam, 1 to 3 percent slopes, is the only soil in this unit. This deep, gently sloping loamy soil is moderately well drained. Permeability is moderately slow, and the available water capacity is high.

Corn grows well on this soil. The use of fertilizer produces a large amount of crop residue, which should be left on or near the surface. Terracing and contour farming help to control water erosion. Diversion terraces and grassed waterways provide protection against runoff from other areas.

CAPABILITY UNIT IIw-1

Freestone fine sandy loam, 0 to 1 percent slopes, is the only soil in this unit. This deep, nearly level loamy soil is somewhat poorly drained to moderately well drained. A perched water table is at a depth of 20 to 35 inches for short periods after heavy rains. Permeability is slow, and the available water capacity is high.

Corn is the main cultivated crop. In a suitable cropping system, corn is grown in rotation, and fertilizer is added to increase production and crop residue. Crop residue is left on or near the surface to improve soil tilth. Field drainage ditches, laterals, and waterways prevent periods of standing water.

CAPABILITY UNIT IIw-2

Kaufman clay is the only soil in this unit. This deep, nearly level, somewhat poorly drained soil is clay throughout. Permeability is very slow, and the available water capacity is high. A surface crust forms after rains.

Grain sorghum grows well on this soil if it is adequately drained. A large amount of residue from crops such as grain sorghum reduces surface crusting and provides protection during heavy rains. The addition of fertilizer increases the growth and residue of cultivated crops.

CAPABILITY UNIT IIw-3

Burleson clay is the only soil in this unit. This deep, nearly level to gently sloping, moderately well drained soil is clay throughout. Permeability is very slow, and the available water capacity is high. This soil is difficult to till, and a surface crust forms after each rain.

Corn is the main crop. A suitable cropping system is one that produces a large amount of crop residue along with the harvested crop. Leaving the residue on the surface reduces surface crusting and provides protection from erosion during heavy rains. The addition of fertilizer increases the growth and residue of cultivated crops.

CAPABILITY UNIT IIIe-1

This unit consists of deep, nearly level to gently sloping loamy soils. These soils are somewhat poorly drained to well drained, and permeability is very slow to slow. The available water capacity is high.

Cotton is the main crop. In a suitable cropping system, corn or other high-residue producing crops are fertilized, and the crop residue is left on or near the surface. Terracing and contour farming help to control water erosion on gentle slopes. Diversion terraces and grassed waterways are needed in some places to protect against runoff.

CAPABILITY UNIT IIIe-2

This unit consists of deep, gently sloping to sloping sandy soils. These soils are moderately well drained to well drained, and permeability is slow to moderate. The available water capacity is low.

These soils are mostly in improved pasture or timber. The few cultivated areas are suited to corn, peanuts, watermelon, and peas. A suitable cropping system is one that uses fertilizer to increase the growth and residue of cultivated crops such as corn. Leaving the residue on or near the surface reduces the hazard of erosion and improves soil tilth.

CAPABILITY UNIT IIIe-3

This unit consists of deep, nearly level to gently sloping loamy soils. These soils are somewhat poorly drained to well drained, and permeability is very slow. The available water capacity is high. A surface crust forms on these soils.

These soils are suited to small grain, grain sorghum, and legumes such as peas and vetch. A large amount of residue, from crops such as small grain, left on the surface reduces crusting. Contour farming and terracing help to control erosion. Grassed waterways and diversions are needed in some places for protection against runoff from higher areas. The application of fertilizer increases the growth and residue of cultivated crops.

CAPABILITY UNIT IIIe-4

This unit consists of deep, gently sloping to sloping loamy soils. These soils are moderately well drained to well drained, and their permeability is moderately slow to moderate. The available water capacity is high.

Cowpeas and corn are the main crops. Other suitable crops are peanuts, oats, and hay. A large amount of residue, from crops such as corn, left on or near the surface protects these soils during heavy rains. The use of fertilizer helps to produce a large amount of crop residue. Terracing and contour farming help to control water erosion. Diversion terraces and grassed waterways are needed in some places for protection against runoff from higher areas.

CAPABILITY UNIT IIIw-1

This unit consists of deep, nearly level to gently sloping sandy soils. These soils are somewhat poorly drained to moderately well drained, and their permeability is moderately slow to rapid. The available water capacity is low.

Drainage is necessary in most cultivated areas. In a suitable cropping system, corn or other crops that produce a large amount of residue are fertilized to increase plant growth and residue. The residue is left on or near the surface to improve soil tilth.

CAPABILITY UNIT IIIw-2

This unit consists of deep, nearly level loamy and sandy soils. These soils are poorly drained to moderately well drained, and their permeability is very slow to slow. The available water capacity is high.

These soils are used mostly for pasture. Corn and grain sorghum are suitable crops where excess water is removed. Because these soils are wet and cold, cool-season crops grow poorly. If the soils are not properly drained, crops should be planted late so that they can grow in summer when soils are drier and warmer. In a suitable cropping system, corn and other high-residue producing crops are fertilized and crop residue is left on or near the surface to improve soil tilth.

CAPABILITY UNIT IIIw-3

Garner clay is the only soil in this unit. This deep, nearly level, poorly drained soil is clay throughout. Permeability is very slow, and the available water capacity is high.

This soil is best suited to grain or forage sorghums grown late in summer. In cultivated areas surface drainage and a sequence of crops that produce a large amount of residue are needed to maintain soil tilth.

CAPABILITY UNIT IIIs-1

This unit consists of deep, gently sloping to sloping sandy soils. These soils are well drained to somewhat excessively drained, and their permeability is moderately rapid to rapid. The available water capacity is low.

Watermelon, peanuts, and corn are suitable crops for these soils. A suitable cropping system is one that uses fertilizer to increase the growth and residue of such crops as corn. Leaving the residue on or near the surface helps reduce erosion and improves soil tilth.

CAPABILITY UNIT IIIs-2

This unit consists of deep, nearly level to gently sloping sandy soils. These soils are moderately well drained to well drained, and their permeability is slow to moderate. The available water capacity is low.

These soils are mostly in improved pasture or timber. The few cultivated areas are used for corn, peanuts, watermelon, and peas. A suitable cropping system is one that produces a large amount of residue from such crops as corn grown in rotation (fig. 16). The addition of fertilizer increases the growth and residue of cultivated crops. Leaving the residue on or near the surface reduces the hazard of erosion and improves soil tilth.

CAPABILITY UNIT IVe-1

This unit consists of deep, gently sloping loamy soils. These soils are somewhat poorly drained to well drained, and their permeability is very slow to slow. The available water capacity is high.

Figure 16.—**Winter cover crop of elbow rye on Fuquay loamy fine sand.**

Corn and grain sorghum are suitable crops for these soils. A suitable cropping system is one that produces a large amount of residue. Leaving the residue on or near the surface helps to control erosion, reduces surface crusting, and improves soil tilth. The use of fertilizer increases the growth and residue of cultivated crops. Terracing and contour farming should be used in areas where row crops are planted. Close-growing crops should be grown continuously in fields that are not terraced.

CAPABILITY UNIT IVe-2

Kirvin fine sandy loam, 3 to 8 percent slopes, is the only soil in this unit. This deep, gently sloping to sloping loamy soil is well drained. Permeability is moderately slow, and the available water capacity is moderate.

This soil is mainly used for pasture or timber. In cultivated areas crops that help to control erosion and improve soil tilth should be grown. The use of fertilizer helps to produce a large amount of residue. Leaving the residue on the surface helps to control erosion. Terracing and contour farming should be used in areas where row crops are planted. Close-growing crops should be grown continuously in areas that are not terraced to control erosion.

CAPABILITY UNIT IVe-3

Heiden clay, 3 to 8 percent slopes, is the only soil in this unit. This deep, gently sloping to sloping clayey soil is well drained. The available water capacity is high, and permeability is very slow. A surface crust generally forms after rain.

This soil is best suited to small grain or other cool-season crops. A suitable cropping system is one that controls erosion and improves tilth. Terracing and contour farming help to control erosion. In fields that are not terraced, close-growing, high-residue producing crops such as small grains are needed. The use of fertilizer helps to produce a large amount of residue. Leaving the residue on or near the surface helps to control erosion, reduces surface crusting, and improves soil tilth.

CAPABILITY UNIT IVe-4

Trawick fine sandy loam, 2 to 8 percent slopes, is the only soil in this unit. This moderately deep to deep, gently sloping to sloping loamy soil is well drained. Permeability is moderately slow, and the available water capacity is high.

This soil is used mainly for timber or pasture. In cultivated areas a suitable cropping system is one that controls erosion. Terracing and contour farming help to control erosion in areas where row crops are planted. Close-growing crops should be grown continuously in areas that are not terraced. The application of fertilizer increases the growth and residue of cultivated crops. Leaving the residue on or near the surface helps to control erosion and improves soil tilth.

CAPABILITY UNIT IVw-1

This unit consists of deep, nearly level loamy soils. These soils are poorly drained to moderately well drained, and their permeability is very slow to slow. The available water capacity is high.

These soils are mainly in forest. Drainage is necessary in cultivated areas. A suitable cropping system includes such crops as corn or grain sorghum that produce a large amount of residue. The use of fertilizer helps to produce a large amount of residue. Leaving the residue on or near the surface improves soil tilth. Because these soils are wet and cold, cool-season crops grow poorly. Crops should be planted late so that they can grow in summer when the soils are drier and warmer.

CAPABILITY UNIT IVs-1

Arenosa fine sand, 1 to 8 percent slopes, is the only soil in this unit. This deep, gently sloping to sloping sandy soil is well drained. Permeability is very rapid, and the available water capacity is low.

This soil is mostly in wooded pasture and is used for grazing. A few areas are cultivated to such crops as peas and watermelon. A suitable cropping system is one that produces a large amount of residue from crops such as corn grown in rotation. Frequent applications of fertilizer during the growing season increase the growth and residue of cultivated crops. Leaving the residue on or near the surface helps to control erosion and improves soil tilth.

CAPABILITY UNIT Vw-1

This unit consists of deep, nearly level loamy soils on flood plains. These soils are moderately well drained to well drained, and their permeability is moderate to moderately rapid. The available water capacity is high.

These soils are not suited to cultivated crops because they are frequently flooded. They are well suited, however, to grasses and trees.

CAPABILITY UNIT Vw-2

This unit consists of deep, nearly level clayey soils on flood plains. These soils are somewhat poorly drained to moderately well drained, and their permeability is very slow. The available water capacity is high. If these soils are not protected, they are subject to frequent flooding that causes scouring and deposition of new soil material.

These soils are used mainly for grazing because they are flooded too frequently for successful cultivation. Some hardwood timber is harvested from wooded areas, and some wooded areas along streams are used mostly as wildlife habitat. These soils are suited to common and Coastal bermudagrass, fescue, and johnsongrass.

CAPABILITY UNIT VIe-1

This unit consists of shallow to deep, gently sloping to moderately steep loamy to clayey soils. These soils are somewhat poorly drained to well drained, and their permeability is very slow to moderate. The available water capacity is low to high.

These soils are not suitable for cultivation.

CAPABILITY UNIT VIe-2

This unit consists only of Darco, Kirvin, and Tenaha soils, sloping. These are deep, sloping to moderately steep sandy soils. They are well drained to somewhat

excessively drained, and their permeability is moderately slow to moderately rapid. The available water capacity is low to moderate.

These soils are not suited to cultivated crops.

CAPABILITY UNIT VIe-3

Normangee clay loam, 3 to 8 percent slopes, is the only soil in this unit. This deep, gently sloping to sloping loamy soil is moderately well drained to well drained. Permeability is very slow, and the available water capacity is high.

This soil is not suited to cultivated crops, but it is suitable for pasture and hay.

CAPABILITY UNIT VIw-1

Nahatche and Wehadkee soils, an undifferentiated mapping unit, makes up this entire unit. These deep, nearly level loamy soils are on flood plains. They are poorly drained to somewhat poorly drained, and their permeability is moderate. The available water capacity is high. These soils are flooded more than once each year. A seasonal high water table is at a depth of 12 to 96 inches.

These soils are not suitable for cultivation.

CAPABILITY UNIT VIw-2

Pelham loamy fine sand, 0 to 5 percent slopes, is the only soil in this unit. This deep, nearly level to gently sloping sandy soil is poorly drained. Permeability is moderate, and the available water capacity is low. The water table is within 15 inches of the surface for long periods during winter and spring.

This soil is not suitable for cultivation.

CAPABILITY UNIT VIs-1

Kirvin stony soils, 5 to 20 percent slopes, is the only soil in this unit. This deep, sloping to moderately steep loamy soil is well drained. Permeability is moderately slow, and the available water capacity is moderate.

This soil is not suitable for cultivation.

Predicted yields

Crop yields in Anderson County depend on the tilth and fertility of the soils and on the amount of moisture available at the time of planting and throughout the growing season. Lack of moisture is commonly a limiting factor. Consistently high yields on any soil normally indicate that the soil has been well managed; that is, fertility has been kept at a high level, rainwater has been held in the soil, erosion has been controlled, and a suitable cropping system has been used.

Table 2 shows predicted yields of the principal crops grown in the county on arable soils. Only the soils suitable for cultivation are listed. The yields are estimated averages for a 15- to 20-year period. In some years yields will be higher than those shown in the table, and in other years they will be lower. These yields

TABLE 2.—*Predicted average yields per acre of principal crops*

[Absence of figure indicates that crop is not generally grown on the specified soil]

Soil	Grain sorghum	Peanuts	Melons	Cowpeas (green)	Corn
	Lbs.	*Lbs.*	*Tons*	*Lbs.*	*Bu.*
Alto fine sandy loam, 1 to 3 percent slopes	—	—	—	—	70
Alto loam, 0 to 1 percent slopes	—	—	—	—	70
Arenosa fine sand, 1 to 8 percent slopes	—	1,000	8	1,200	—
Axtell fine sandy loam, 0 to 3 percent slopes	2,000	—	—	—	35
Axtell fine sandy loam, 2 to 5 percent slopes, eroded	1,500	—	—	—	25
Bernaldo fine sandy loam, 0 to 1 percent slopes	—	1,600	12	2,000	65
Bowie fine sandy loam, 1 to 3 percent slopes	—	1,400	12	2,000	55
Bowie fine sandy loam, 3 to 8 percent slopes	—	1,200	10	1,600	50
Burleson clay	4,000	—	—	—	50
Chipley fine sand, 0 to 5 percent slopes	—	—	—	1,600	55
Darco fine sand, 1 to 8 percent slopes	—	1,000	8	1,500	45
Dougherty loamy fine sand, 1 to 5 percent slopes	1,500	1,200	10	1,600	50
Elrose fine sandy loam, 1 to 3 percent slopes	—	1,400	10	1,800	60
Elrose fine sandy loam, 3 to 8 percent slopes	—	1,000	8	1,500	55
Eustis fine sand, 2 to 8 percent slopes	—	1,200	8	1,800	45
Freestone fine sandy loam, 0 to 1 percent slopes	—	—	—	1,500	50
Freestone fine sandy loam, 1 to 5 percent slopes	—	—	—	1,500	40
Fuquay loamy fine sand, 0 to 3 percent slopes	—	1,400	12	2,000	60
Fuquay loamy fine sand, 3 to 8 percent slopes	—	1,300	10	1,800	55
Galey fine sandy loam, 0 to 3 percent slopes	2,250	1,400	—	2,000	60
Garner clay	—	—	—	—	30
Kenney loamy fine sand, 1 to 5 percent slopes	—	1,200	8	1,800	30
Konawa fine sandy loam, 2 to 5 percent slopes	2,000	400	—	1,500	50
Konawa soils, 5 to 8 percent slopes, eroded	1,700	900	—	—	—
Kullit fine sandy loam, 1 to 3 percent slopes	2,000	—	—	2,000	45
Larue loamy fine sand, 1 to 3 percent slopes	—	1,200	10	1,800	60
Larue loamy fine sand, 3 to 8 percent slopes	—	1,200	10	1,600	55
Leefield loamy fine sand, 1 to 5 percent slopes	—	—	—	1,600	55
Nimrod loamy fine sand, 0 to 3 percent slopes	—	1,200	10	1,600	50
Normangee clay loam, 1 to 3 percent slopes	2,000	—	—	—	35
Stidham loamy fine sand, 1 to 5 percent slopes	2,000	1,300	12	1,800	50
Trawick fine sandy loam, 2 to 8 percent slopes	—	—	—	1,500	45
Trep loamy fine sand, 1 to 5 percent slopes	—	1,200	12	1,600	45
Wilson clay loam, 0 to 3 percent slopes	2,250	—	—	—	35

are based on records of experiment stations and on data reported by farmers and others familiar with the soils.

The yields shown in table 2 are those expected under a high level of management. All of the following management practices are used to acquire these yields:

1. Managing crop residue in a way that effectively controls erosion and protects the soil.
2. Using a cropping sequence that maintains an adequate supply of organic material.
3. Maintaining fertility by timely application of fertilizer and by growing soil-improving crops.
4. Conserving rainwater.
5. Controlling of insects, diseases, and weeds is timely.
6. Keeping tillage to a minimum and tilling only when the moisture content is such that compaction is minimized.
7. Planting improved crop varieties.
8. Using terraces and other mechanical aids where needed and maintaining them.

Use of the Soils for Pasture and Hay

Pasture and hay are important in Anderson County because raising livestock is the main farm enterprise. For the past several years, the trend has been to convert land from other uses to pasture and hay. Land used for pasture and hay usually is planted to introduced grasses that respond to good management.

Some of the grasses adapted and used in Anderson County are the improved Coastal variety of bermudagrass, weeping lovegrass, bahiagrass, kleingrass-75, and fescue. Grazing programs often include bermudagrass overseeded with crimson clover or vetch.

Year-round forage programs can be developed by planning land use and the kinds of forage to be grown. Such a planned grazing system increases the production of the unit by providing for timely rest periods from grazing, for good livestock management, and for a more efficient forage harvest.

Well-managed pasture requires an adequate fence arrangement for rotational grazing and the efficient use of forage. Proper use of forage insures that plants retain vigor. In well-managed pasture weeds are controlled; fertilization is at the proper time and in the proper amounts; and there is an adequate supply of water for livestock.

Well-managed soils used for hay production require the selection of the more productive kinds of grass and the application of fertilizer at the correct time and in adequate amounts. Forage is cut at the proper intervals to provide for high quality, and cutting heights are adequate to maintain plant vigor and timely regrowth.

The following section describes the pasture and hay suitability groups and some of the management needed for good production of forage.

Pasture and hay suitability groups

The soils in Anderson County have been assigned to 13 pasture and hay groups according to their suitability for the production of forage. The soils in each group are enough alike to be suited to the same grasses, to have similar limitations and hazards, to require similar management, and to show similar productivity and other responses to management. Thus, the pasture and hay group is a convenient grouping of soils for their management. The pasture and hay groups are not numbered consecutively in Anderson County because not all the groups recognized in Texas are in this county.

Table 3 shows predicted yields of the principal grasses, if fertilized and properly managed, for each mapping unit in the county. Yields are given in animal-unit-month (A.U.M.) of production for pasture and in tons per acre for hay. An animal-unit-month is the amount of forage or feed required to maintain one animal unit, or 1,000 pounds of live weight, for a period of 30 days. It represents 1,200 pounds of air-dry forage produced.

PASTURE AND HAY GROUP 1A

This group consists of deep, nearly level clays on bottom lands. All areas of these soils are subject to flooding unless protected by levees, and some are frequently flooded. Permeability is very slow, and the available water capacity is high. These soils are somewhat poorly drained to moderately well drained. They become puddled if they are grazed when wet.

Seedbed preparation is difficult. Nitrogen and phosphorus are needed to maintain adequate forage production. The production potential is high for such kinds of grass as improved bermudagrass, fescue, dallisgrass, johnsongrass, and bahiagrass.

PASTURE AND HAY GROUP 2A

This group consists of deep, nearly level loamy soils on bottom lands. All areas of these soils are flooded one or more times each year. Permeability is moderate to moderately rapid, and the available water capacity is high. These soils are poorly drained to well drained.

Soils in this group are productive, but to maintain high forage production a complete fertilizer of nitrogen, phosphorus, and potassium is needed. The production potential is high for such grasses as improved bermudagrass, johnsongrass, bahiagrass, fescue, and dallisgrass.

PASTURE AND HAY GROUP 7A

This group consists of deep, nearly level to sloping clayey soils on uplands. Some areas of these soils are eroded. Permeability is very slow, and the available water capacity is high. These soils are poorly drained to well drained. They become puddled if they are grazed when wet.

Seedbed preparation is difficult. Nitrogen and phosphorus are needed to maintain adequate forage production. The production potential is medium to high for such kinds of grass as improved bermudagrass, fescue, and johnsongrass.

PASTURE AND HAY GROUP 7H

This group consists of deep, nearly level to gently sloping loamy soils. Permeability is very slow, and the available water capacity is high. These soils are somewhat poorly drained to well drained. They become compacted if they are grazed when wet.

Grass establishment is difficult because a crust forms on the surface. Nitrogen, phosphorus, and potassium are needed to maintain adequate forage production. The

TABLE 3.—*Predicted yields of principal grasses*

[Absence of figures indicates data not available]

Soil	Coastal bermudagrass		Common bermudagrass
	A.U.M.[1]	*Tons of hay*	*A.U.M.*[1]
Alto fine sandy loam, 1 to 3 percent slopes	12.0	8	5.0
Alto loam, 0 to 1 percent slopes	12.0	8	5.0
Arenosa fine sand, 1 to 8 percent slopes	5.0		3.5
Axtell fine sandy loam, 0 to 3 percent slopes			5.5
Axtell fine sandy loam, 2 to 5 percent slopes			5.0
Axtell fine sandy loam, 5 to 12 percent slopes			3.0
Axtell-Wrightsville complex, 0 to 1 percent slopes			5.5
Bernaldo fine sandy loam, 0 to 1 percent slopes		8	
Bowie fine sandy loam, 1 to 3 percent slopes	10.0		
Bowie fine sandy loam, 3 to 8 percent slopes	8.0		
Burleson clay	7.0		
Chipley fine sand, 0 to 5 percent slopes	7.0		
Darco fine sand, 1 to 8 percent slopes		7	
Darco, Kirvin, and Tenaha soils, sloping			3.0
Dougherty loamy fine sand, 1 to 5 percent slopes			5.0
Elrose fine sandy loam, 1 to 3 percent slopes	8.0	5	
Elrose fine sandy loam, 3 to 8 percent slopes	8.0	5	
Elrose fine sandy loam, 8 to 12 percent slopes	7.0	4	
Eustis fine sand, 2 to 8 percent slopes	5.0		
Ferris clay, 5 to 8 percent slopes, eroded			3.0
Freestone fine sandy loam, 0 to 1 percent slopes		8	
Freestone fine sandy loam, 1 to 5 percent slopes		8	
Freestone-Lufkin complex		8	
Fuquay loamy fine sand, 0 to 3 percent slopes	8.0	5	
Fuquay loamy fine sand, 3 to 8 percent slopes	7.5	4.5	
Galey fine sandy loam, 0 to 3 percent slopes			6.0
Garner clay	9.0		
Hannahatchee fine sandy loam	12.0		
Heiden clay, 3 to 8 percent slopes			5.0
Kaufman clay	8.0		
Kaufman clay, frequently flooded	8.0		
Kenney loamy fine sand, 1 to 5 percent slopes		6	
Kirvin fine sandy loam, 3 to 8 percent slopes			2.5
Kirvin complex, 5 to 20 percent slopes			2.5
Kirvin complex, graded, 2 to 8 percent slopes			2.5
Kirvin-Sacul association, sloping			2.5
Kirvin stony soils, 5 to 20 percent slopes			2.0
Konawa fine sandy loam, 2 to 5 percent slopes			6.0
Konawa soils, 5 to 8 percent slopes, eroded			5.5
Kullit fine sandy loam, 1 to 3 percent slopes	9.0		
Larue loamy fine sand, 1 to 3 percent slopes		5.2	
Larue loamy fine sand, 3 to 8 percent slopes		5.2	
Leefield loamy fine sand, 1 to 5 percent slopes	8.5	5	
Lufkin fine sandy loam, 0 to 1 percent slopes		8	
Nahatche and Wehadkee soils		5	
Nimrod loamy fine sand, 0 to 3 percent slopes			5.5
Normangee clay loam, 1 to 3 percent slopes	6.0		
Normangee clay loam, 3 to 8 percent slopes	5.0		
Pelham loamy fine sand, 0 to 5 percent slopes			3.0
Robinsonville fine sandy loam	10.0		
Sacul fine sandy loam, 1 to 5 percent slopes			5.0
Stidham loamy fine sand, 1 to 5 percent slopes			5.5
Susquehanna fine sandy loam, 1 to 5 percent slopes	8.5		
Susquehanna soils, 3 to 10 percent slopes, eroded	7.0		
Thenas fine sandy loam	12.0		
Trawick fine sandy loam, 2 to 8 percent slopes			3.5
Trawick fine sandy loam, 8 to 20 percent slopes			3.0
Trawick and Bub soils, moderately steep			3.0
Trep loamy fine sand, 1 to 5 percent slopes			6.0
Trinity clay	8.0		
Wilson clay loam, 0 to 3 percent slopes			5.5
Wrightsville clay loam	7.0		

[1] Animal-unit-month. The amount of forage or feed required to maintain one animal unit, 1,000 pounds live weight, for a period of 30 days.

production potential is medium to high for such kinds of grass as improved bermudagrass, weeping lovegrass, and bahiagrass.

PASTURE AND HAY GROUP 7I

Normangee clay loam, 3 to 8 percent slopes, is the only soil in this group. This deep, gently sloping to sloping loamy soil is on uplands. Permeability is very slow, and the available water capacity is high. This soil is moderately well drained to well drained. It becomes compacted if it is grazed when wet.

Grass establishment is difficult because a crust forms on the surface. Nitrogen, phosphorus, and potassium are needed to maintain adequate forage production. The production potential is medium for such kinds of grass as improved bermudagrass, weeping lovegrass, and bahiagrass.

PASTURE AND HAY GROUP 8A

This group consists of deep, nearly level to gently sloping loamy soils on uplands. Permeability is very slow to slow, and the available water capacity is high. These soils are somewhat poorly drained to well drained.

Nitrogen, phosphorus, and potassium are needed to maintain adequate forage production. The production potential is medium to high for such grasses as improved bermudagrass, weeping lovegrass, and bahiagrass.

PASTURE AND HAY GROUP 8B

Axtell fine sandy loam, 5 to 12 percent slopes, is the only soil in this group. This deep, sloping to strongly sloping loamy soil is on uplands. Permeability is very slow, and the available water capacity is high. This soil is moderately well drained to well drained.

Nitrogen, phosphorus, and potassium are needed for sustained forage production. This group is suited to use as winter grazing areas. The production potential is medium for such grasses as improved bermudagrass, weeping lovegrass, and bahiagrass.

PASTURE AND HAY GROUP 8C

This group consists of deep to moderately deep, nearly level to sloping loamy soils on uplands. Permeability is slow to moderate, and the available water capacity is moderate to high. These soils are somewhat poorly drained to well drained.

Complete fertilizers are needed for sustained forage production. The production potential is medium to high for such grasses as improved bermudagrass, weeping lovegrass, and bahiagrass (fig. 17).

PASTURE AND HAY GROUP 8D

This group consists of deep to shallow, gently sloping to moderately steep loamy soils on uplands. Permeability is slow to moderate, and the available water capacity is low to high. These soils are moderately well drained to well drained.

Complete fertilizers are needed for sustained forage production. The production potential is medium to high for such grasses as improved bermudagrass, weeping lovegrass, and bahiagrass.

Figure 17.—**Lovegrass in late part of growing season. The soil is Elrose fine sandy loam, 1 to 3 percent slopes.**

PASTURE AND HAY GROUP 8E

This group consists of deep, nearly level, loamy and sandy soils on uplands. These soils are poorly drained to moderately well drained. Permeability is very slow to slow, and the available water capacity is high. Drainage may be needed because the surface of these soils may be saturated for several months during the year.

Limestone and complete fertilizers are needed for sustained forage production. The production potential is moderate for such grasses as improved bermudagrass, dallisgrass, and fescue.

PASTURE AND HAY GROUP 9A

This group consists of deep, nearly level to sloping sandy soils on uplands. Permeability is slow to moderate, and the available water capacity is low.

Grass is difficult to establish on a clean seedbed because these loose sandy soils are subject to blowing. A complete fertilizer, applied at planned intervals during the growing season, is needed for sustained forage production. The production potential is medium to high for grasses such as improved bermudagrass and weeping lovegrass.

PASTURE AND HAY GROUP 9B

This group consists of deep to moderately deep, gently sloping to moderately steep sandy soils on uplands. Permeability is moderately slow to very rapid, and the available water capacity is low to moderate. These soils are well drained to somewhat excessively drained.

A complete fertilizer, applied frequently during the growing season, is needed for sustained forage production. A firm seedbed is difficult to obtain, and emerging grass can be killed if the cutting action of blowing sand is not controlled. The production potential is medium for such grasses as weeping lovegrass or improved bermudagrass.

PASTURE AND HAY GROUP 9C

This group consists of deep, nearly level to gently sloping sandy soils. Permeability is moderately slow to rapid, and the available water capacity is low. The soils are poorly drained to moderately well drained, and surface drainage may be needed.

Limestone and complete fertilizers are needed for sustained forage production. The production potential is medium for such grasses as bahiagrass, dallisgrass, and fescue.

Use of the Soils for Woodland [3]

The uplands of Anderson County were once forested with loblolly and shortleaf pine mixed with hickory, sweetgum, and various kinds of oak. The bottom lands were forested mainly with water oak, willow oak, sweetgum, white oak, and ash. Some of the sandier soils on the bottom lands had mixed stands of loblolly pine, red oak, sweetgum, blackgum, black walnut, and sycamore. The virgin stands were cut for lumber and to make way for planting row crops of peanuts, corn, cotton, and sugarcane.

At present, more than half of Anderson County is woodland. The uplands are covered mainly with loblolly and shortleaf pine and a mixture of hardwoods. Shortleaf pine is dominant. Some of the deep sandy soils have a dominant cover of oak and a scattering of shortleaf pine. Many formerly cultivated fields have been planted to loblolly and slash pine. The soils on bottom lands are left mostly to regenerate naturally and are covered mainly with hardwood.

Production of wood crops

Table 4 gives information useful to owners and operators of woodland who want to establish, manage, and harvest tree crops. It shows the woodland group of each soil, the average site index of dominant trees, other desirable species, the species preferred for planting, and the factors to be considered in management. This information can help owners of woodland in considering alternative uses of the soils, in selecting the kinds of trees that will produce the best wood crops, and in determining the feasibility of using various intensities of woodland management.

Site index is the height, in feet, a tree will reach at the age of 50 years.

Erosion hazard is the potential erodibility of soils used for trees and depends mainly on soil texture and slope. The hazard is *slight* if no special measures are needed. It is *moderate* if some precautions are needed to control erosion on access roads, logging trails, and constructed fire lanes. The hazard is *severe* if special equipment, treatments or methods are needed to control erosion caused by the application of forest management practices.

Equipment limitation refers to the restrictions or limitations in the use of equipment in harvesting or managing the tree crop as affected by soil wetness, rockiness or stoniness, slope, and texture of the surface layer. The rating is *slight* if use of equipment is not limited. It is *moderate* if there is a seasonal limitation of less than 3 months in use of equipment or if modified methods, modified equipment, or both, are needed to prevent damage to tree roots. Limitation is *severe* if specialized equipment or operations are needed, if there are seasonal restrictions of more than 3 months in the use of equipment, or if there is severe damage to tree roots unless equipment and methods used in managing or harvesting tree crops are modified.

Seedling mortality is the expected degree of mortality of seedlings, either those growing naturally or planted, on a kind of soil. A rating of *slight* means that less than 25 percent of the planted stock die and adequate natural regeneration of the stand will take place. Mortality is *moderate* if 25 to 50 percent of planted stock die and natural regeneration is not always reliable for adequate restocking without special treatment measures. It is *severe* if more than 50 percent of planted seedlings die, natural regeneration is inadequate, and special seedbed preparation is needed.

Seedlings must be planted by the best methods available to insure a full stand of trees.

[3] By LARRY BRINK, woodland conservationist, Soil Conservation Service.

TABLE 4.—*Woodland groups, wood crops, and factors in management*

[Absence of figure in column headed "Site Index" indicates no reliable data available]

Soil and map symbols	Woodland group	Potential productivity		Other desirable species	Preferred species for planting	Erosion hazard	Equipment limitation	Seedling mortality
		Species	Site index					
Alto: AfB, AlA	3o7	Loblolly pine Shortleaf pine Red oak	80 70 75	Sweetgum, white oak, slash pine.	Loblolly pine, shortleaf pine.	Slight	Slight	Slight.
Arenosa: ArD	5s3	Shortleaf pine	65	Loblolly pine	None	Slight	Moderate	Severe.
Axtell: AtB, AtC2, AtE, AwA Not used for commercial woodland.	5c0							
Bernaldo: BeA	2o7	Loblolly pine Shortleaf pine Sweetgum Red oak	90 80 80 —	White oak, slash pine.	Loblolly pine, shortleaf pine, red oak.	Slight	Slight	Slight.
Bowie: BoB, BoD	3o1	Loblolly pine Shortleaf pine	83 77	Slash pine	Loblolly pine, shortleaf pine.	Slight	Slight	Slight.
Bub Mapped only with Trawick soils.	4r3	Shortleaf pine Loblolly pine	60 70	None	None	Slight	Moderate	Severe.
Burleson: Bu Not used for commercial woodland.	5c0							
Chipley: ChC	3w2	Loblolly pine Shortleaf pine	80 70	Slash pine	Loblolly pine, slash pine, shortleaf pine.	Slight	Moderate	Moderate.
Darco: DaD, DkF For Kirvin and Tenaha parts of DkF, see Kirvin (KlF) and Tenaha series.	4s3	Loblolly pine Shortleaf pine	70 60	Slash pine	Loblolly pine, shortleaf pine.	Slight	Moderate	Severe.
Dougherty: DoC Not used for commercial woodland.	5s0							
Elrose: ElB, ElD, ElE	3o1	Loblolly pine Shortleaf pine	80 70	Slash pine, red oak, black walnut, white oak.	Loblolly pine	Slight	Slight	Slight.
Eustis: EuD	3s3	Loblolly pine Shortleaf pine	80 70	Slash pine	Loblolly pine	Slight	Moderate	Severe.
Ferris: FcD2 Not used for commercial woodland.	5c0							
Freestone: FrA, FrC, Fs Not used for commerical woodland.	5o0							
Fuquay: FuB, FuD	3s2	Loblolly pine	80	Red oak, slash pine.	Loblolly pine, slash pine, shortleaf pine.	Slight	Moderate	Moderate.
Galey: GaB Not used for commercial woodland.	5o0							
Garner: Gc Not used for commercial woodland.	5c0							
Hannahatchee: Ha	1o7	Loblolly pine Sweetgum Red oak White oak	110 100 90 —	Slash pine, black walnut, sycamore, hard maple.	Loblolly pine, sweetgum.	Slight	Slight	Slight.

TABLE 4.—*Woodland groups, wood crops, and factors in management*—Continued

Soil and map symbols	Woodland group	Potential productivity: Species	Potential productivity: Site index	Other desirable species	Preferred species for planting	Erosion hazard	Equipment limitation	Seedling mortality
Heiden: HeD—Not used for commercial woodland.	5c0							
Kaufman: Ka, Kc	1w6	Cottonwood Sweetgum Water oak	110 100 100	Blackgum	Cottonwood	Slight	Severe	Moderate.
Kenney: KeC	3s2	Loblolly pine Shortleaf pine	80 70	Slash pine	Loblolly pine, shortleaf pine.	Slight	Moderate	Moderate.
Kirvin: KfD	3o1	Loblolly pine Shortleaf pine	80 70	Red oak	Loblolly pine, shortleaf pine.	Slight	Slight	Slight.
KlF, KrF	4d2	Loblolly pine Shortleaf pine	70 60	Red oak	Shortleaf pine.	Slight	Moderate	Moderate.
KmD, KnE—For Sacul part of KnE, see Sacul series.	4c2	Loblolly pine Shortleaf pine	70 60	Red oak	Loblolly pine, shortleaf pine.	Slight to moderate.	Moderate	Moderate.
Konawa: KsC, KtD2—Not used for commercial woodland.	5o0							
Kullit: KuB	3w8	Loblolly pine Shortleaf pine Sweetgum	80 70 80	Red oak, slash pine.	Loblolly pine, sweetgum.	Slight	Moderate	Slight.
Larue: LaB, LaD	3s2	Loblolly pine Shortleaf pine	80 70	White oak, black walnut.	Loblolly pine, shortleaf pine.	Slight	Moderate	Moderate.
Leefield: LeC	3w2	Loblolly pine	80	Shortleaf pine, slash pine, red oak.	Loblolly pine, slash pine.	Slight	Moderate	Moderate.
Lufkin: LuA—Not used for commercial woodland.	5w0							
Nahatche: Na—For Wehadkee part of Na, see Wehadkee series.	1w6	Water oak Willow oak Cottonwood	100 — —	Loblolly pine	Cottonwood, water oak.	Slight	Severe	Severe.
Nimrod: NdB—Not used for commercial woodland.	5s0							
Normangee: NoB, NoD—Not used for commercial woodland.	5c0							
Pelham: PeC	2w3	Loblolly pine Sweetgum	90 80	Blackgum, soft maple, water oak.	Loblolly pine, slash pine.	Slight	Severe	Severe.
Robinsonville: Ro	1o7	Loblolly pine Sweetgum Sycamore	96 100 —	Blackgum, green ash.	Loblolly pine, sweetgum, slash pine, cottonwood, sycamore.	Slight	Slight	Slight.
Sacul: SaC	3c2	Loblolly pine Shortleaf pine	80 70	Red oak	Loblolly pine	Slight	Slight to moderate.	Moderate.
Stidham: SmC—Not used for commercial woodland.	5s0							
Susquehanna: SsC, SuD2	3c2	Loblolly pine Shortleaf pine	78 68	Red oak	Loblolly pine	Slight to moderate.	Moderate	Slight to moderate.

TABLE 4.—*Woodland groups, wood crops, and factors in management*—Continued

Soil and map symbols	Woodland group	Potential productivity: Species	Potential productivity: Site index	Other desirable species	Preferred species for planting	Erosion hazard	Equipment limitation	Seedling mortality
Tenaha: Mapped only with Darco and Kirvin soils.	4s3	Loblolly pine Shortleaf pine	70 65	Slash pine	Loblolly pine	Slight	Moderate	Severe.
Thenas: Th	1w8	Loblolly pine Shortleaf pine Sweetgum Blackgum Red oak White oak	110 100 100 90 — —	Slash pine	Loblolly pine, slash pine, sweetgum.	Slight	Moderate	Moderate.
Trawick:								
TkD, TkF	3o1	Loblolly pine Shortleaf pine	78 70	Red oak, sweetgum.	Loblolly pine	Slight	Slight	Slight.
TmF For Bub part of TmF, see Bub series.	4r3	Loblolly pine Shortleaf pine	73 65	None	None	Slight	Moderate	Severe.
Trep: TpC	3s2	Loblolly pine Shortleaf pine	80 70	None	Loblolly pine	Slight	Moderate	Moderate.
Trinity: Tr	1w6	Cottonwood Water oak Willow oak Green ash	100 — — —	Hackberry	Cottonwood, green ash.	Slight	Severe	Severe.
Wehadkee Mapped only with Nahatche soils.	1w6	Sweetgum	93	Loblolly pine	Cottonwood, wateroak.	Slight	Severe	Severe.
Wilson: WlB Not used for commercial woodland.	5c0							
Wrightsville: Wr Not used for commercial woodland.	5w0							

Woodland suitability groups

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect the growth of trees and the management of stands. For this reason, the soils of Anderson County have been placed in 21 woodland suitability groups. Each group consists of soils that have about the same restrictions and limitations, require about the same management, and grow similar varieties of trees. The soils in four of these groups are unable to produce repeated crops of commercially valuable trees for the production of wood products.

Each woodland suitability group is identified by a three-part symbol. The first figure, an Arabic numeral from 1 to 5, indicates the woodland suitability class, which expresses productivity based on site index. Class 1 has the highest potential productivity and class 5 the lowest.

The second digit, a lowercase letter, indicates the woodland suitability subclass. The subclass indicates whether or not a restriction or inhibitory factor affects use and management of the soil.

The third part is an Arabic numeral from 1 to 10 (10 is shown as 0) that indicates the degree of restriction caused by the inhibitory factor expressed in the subclass and the kinds of trees that are best adapted to this group. For example: woodland group 3s2 has moderately high productivity (class); a restriction because the soil surface is sandy (subclass); and the degree of restriction is moderate for use of equipment, seedling mortality is normally moderate, and soils are best adapted for growing pine trees.

Woodland suitability subclasses, the second category of the system, are defined as follows:

Subclass x (stoniness or rockiness) soils are restricted or limited for woodland use or management by stones or rocks.

Subclass w (excessive wetness) soils have excessive water, either seasonally or year around, which significantly limits woodland use or management. These soils have restricted drainage, a high water table, or a flooding hazard that adversely affects either stand development or management.

Subclass t (toxic substances) soils have, within the rooting zone, excessive alkalinity, acidity, sodium salts,

or other toxic substances that limit or impede the development of desirable kinds of trees.

Subclass d (restricted rooting depth) soils are restricted or limited for woodland use or management because of restricted rooting depths. Soils that are shallow to hard rock, to a hardpan, or to other layers in the soil that restrict roots are examples.

Subclass c (clayey) soils are restricted or limited for woodland use or management because of the kind or amount of clay in the upper part of the soil profile.

Subclass s (sandy) soils are dry, sandy, have little or no textural B horizon, and have moderate to severe restrictions or limitations for woodland use or management. These soils have limitations for use of equipment, have low moisture-holding capacity, and normally are low in available plant nutrients.

Subclass f (fragmental or skeletal) soils are restricted or limited for woodland use or management because large amounts of coarse fragments that are larger than 2 millimeters in diameter but smaller than 10 inches are in the profile, including flaggy soils.

Subclass r (relief or slope steepness) soils are restricted or limited for woodland use or management by steepness of slope.

Subclass o (slight or no limitations) soils have no significant restrictions or limitations for woodland use or management.

Some kinds of soils may have more than one set of subclass characteristics. Priority in placing each kind of soil into a subclass is according to the foregoing list of subclass characteristics.

The suitability of the soils for certain kinds of trees and the degree of erosion hazard, equipment restrictions, and seedling mortality are factors to be considered. Ratings are as follows:

The numeral 1 indicates soils that have no limitations or only slight limitations and are best suited to needleleaf trees.

The numeral 2 indicates soils that have one or more moderate management problems and are best suited to needleleaf trees.

The numeral 3 indicates soils that have one or more severe management problems and are best suited to needleleaf trees.

The numeral 4 indicates soils that have few or no management problems and are best suited to broadleaf trees.

The numeral 5 indicates soils that have one or more moderate management problems and are best suited to broadleaf trees.

The numeral 6 indicates soils that have one or more severe management problems and are best suited to broadleaf trees.

The numeral 7 indicates soils that have few or no management problems and are well suited to either needleleaf or broadleaf trees.

The numeral 8 indicates soils that have one or more moderate management problems and are well suited to either needleleaf or broadleaf trees.

The numeral 9 indicates soils that have one or more severe management problems and are well suited to either needleleaf or broadleaf trees.

The numeral 0 indicates that the soils are not suitable for the production of major commercial wood products.

To find the woodland suitability for any soil in Anderson County, refer to the "Guide to Mapping Units" at the back of this survey.

WOODLAND GROUP 1w6

This group consists of nearly level, poorly drained to moderately well drained clayey and loamy soils on bottom lands. These soils are flooded in most years. Permeability is very slow to moderate, and the available water capacity is high.

Plant competition is severe because the abundant moisture causes unwanted trees, shrubs, and vines to grow. When an opening is made in the canopy, weeding is sometimes necessary to release seedlings for normal growth. Water oak, sweetgum, and blackgum are the main kinds of hardwood trees.

WOODLAND GROUP 1w8

Thenas fine sandy loam, is the only soil in this group. This nearly level loamy soil is moderately well drained and is on bottom lands. Permeability is moderate, and the available water capacity is high.

Plant competition is severe. When openings are made in the canopy, unwanted trees, shrubs, and vines need to be controlled to release seedlings for normal growth. Both pine and hardwood grow on this soil, and except in old fields, each makes up about half of the stands. Most old fields are covered with loblolly pine, both natural and planted.

WOODLAND GROUP 1o7

This group consists of nearly level, well-drained loamy soils on bottom lands. Permeability is moderate to moderately rapid, and the available water capacity is high. These soils are frequently flooded.

Plant competition is severe. Loblolly pine, sweetgum, and red oak grow in mixed stands on these soils. Black walnut, black cherry, southern hard maple, and white ash are common.

WOODLAND GROUP 2w3

Pelham loamy fine sand, 0 to 5 percent slopes, is the only soil in this group. This poorly drained sandy soil is nearly level to gently sloping and is on uplands. Permeability is moderate, and the available water capacity is low.

The high water table creates a moderate hazard of windthrow. Plant competition is severe. Loblolly pine is scattered throughout mixed stands of poor-quality soft maple, water oak, and blackgum. Overall production is low because the number of desirable trees is small.

WOODLAND GROUP 2o7

Bernaldo fine sandy loam, 0 to 1 percent slopes, is the only soil in this group. This well-drained loamy soil is nearly level and is on uplands. Permeability is moderate, and the available water capacity is moderate.

This soil is well suited as woodland. Most woodland areas have a dominant stand of loblolly pine, but hardwood trees such as red oak, sweetgum, and hickory

also grow well. Because the potential productivity of this soil is high, plant competition is severe. When openings are made in the canopy, vines and shrubs quickly cover the open areas. These unwanted plants need to be removed in order to release seedlings for normal growth.

WOODLAND GROUP 3w2

The group consists of nearly level to gently sloping, somewhat poorly drained to moderately well drained sandy soils on uplands. Permeability is moderately slow to rapid, and the available water capacity is low. The water table fluctuates between a depth of 2 and 5 feet for 2 to 6 months in most years.

Plant competition is severe. The hazard of windthrow is moderate during extremely wet periods. Pines are best adapted to these soils. Loblolly pine is the dominant kind of tree, but slash pine also grows well. Shortleaf pine, sweetgum, and water oak also grow on these soils.

WOODLAND GROUP 3w8

Kullit fine sandy loam, 1 to 3 percent slopes, is the only soil in this group. This moderately well drained loamy soil is gently sloping and is on uplands. Permeability is slow, and the available water capacity is high.

Plant competition is severe. The hazard of windthrow is slight except during short periods when the surface layer is saturated with water. Loblolly pine, water oak, willow oak, shortleaf pine, and red oak grow in mixed stands on this soil.

WOODLAND GROUP 3c2

This group consists of gently sloping to strongly sloping, somewhat poorly drained to moderately well drained loamy soils on uplands. Permeability is very slow to slow, and the available water capacity is high.

Plant competition is severe. Loblolly pine and shortleaf pine are the dominant kinds of trees. Only a scattering of hardwood trees, mostly hickory and sweetgum, grow on these soils.

WOODLAND GROUP 3s2

This group consists of nearly level to sloping, moderately well drained to well drained sandy soils on uplands. Permeability is slow to rapid, and the available water capacity is low.

Plant competition is slight. Loblolly pine and shortleaf pine are the dominant kinds of trees, but a few hardwood trees are scattered throughout all the soils in this group. Most abandoned fields are covered with persimmon and sassafras thickets, but some fields have been planted to slash pine and loblolly pine (fig. 18).

WOODLAND GROUP 3s3

Eustis fine sand, 2 to 8 percent slopes, is the only soil in this group. This somewhat excessively drained sand is gently sloping to gently rolling and is on uplands. Permeability is moderately rapid to rapid, and the available water capacity is low.

Plant competition is slight in abandoned fields. Shortleaf pine, loblolly pine, and a few scattered hardwood trees, mainly hickory, red oak, and sandjack oak, grow on this soil. Some cultivated fields have been planted to slash pine and loblolly pine. These areas have little understory. Sassafras and persimmon grow in thickets in some areas and allow little reseeding to take place.

WOODLAND GROUP 3o1

This group consists of moderately well drained to well drained, gently sloping to moderately steep loamy soils on uplands. Permeability is moderately slow to moderate, and the available water capacity is moderate to high.

Plant competition is moderate, and few management problems exist with these soils. Loblolly pine and shortleaf pine are the dominant kinds of trees (fig. 19).

WOODLAND GROUP 3o7

This group consists of moderately well drained, nearly level to gently sloping loamy soils on uplands. Permeability is moderately slow, and the available water capacity is high.

Shortleaf pine is the dominant kind of tree and grows in mixed stands of loblolly pine, southern red oak, and sweetgum. Black hickory, blackjack oak, and post oak are common but less valuable trees.

WOODLAND GROUP 4d2

This group consists of sloping to moderately steep, well-drained loamy soils on uplands. Permeability is moderately slow, and the available water capacity is moderate. Pebbles, cobbles, stones, and boulders are on the surface and in the soil in some places.

Shortleaf pine is the dominant kind of tree. Loblolly pine, sweetgum, black hickory, southern red oak, and elm also grow on these soils, but they do not attain an acceptable level of growth.

WOODLAND GROUP 4c2

This group consists of gently sloping to sloping, moderately well drained to well drained loamy soils on uplands. Permeability is slow to moderately slow, and the available water capacity is moderate to high. Some areas have had the top layers of the soil removed and used for road building material.

Plant competition is moderate. The hazard of windthrow is moderate because roots develop poorly in some areas of these soils. Shortleaf pine is the dominant kind of tree. Hickory, red oak, loblolly pine, and sweetgum also grow on these soils.

WOODLAND GROUP 4s3

This group consists of gently sloping to moderately steep, well drained to somewhat excessively drained sandy soils on uplands. Permeability is moderately slow to moderately rapid, and the available water capacity is low to moderate.

Plant competition is slight, and the hazard of windthrow is slight. Shortleaf pine grows more commonly on these soils than does loblolly pine. Red oak often grows but is of secondary importance.

WOODLAND GROUP 4r3

Trawick and Bub soils, moderately steep, is the only mapping unit in this group. These are gently sloping to moderately steep, well-drained loamy soils on uplands.

Figure 18.—**Young pine forest, recently thinned, on Fuquay loamy fine sand.**

Permeability is moderately slow, and the available water capacity is low to high.

Plant competition is moderate, and the hazard of windthrow is slight. Shortleaf pine is the main commercial tree. Loblolly pine, sweetgum, and red oak also commonly grow on these soils.

WOODLAND GROUP 5w0

This group consists of nearly level, poorly drained to somewhat poorly drained loamy soils on uplands. Permeability is very slow to slow, and the available water capacity is high.

Loblolly pine rarely grows on these soils. Water oak and post oak are the main woody plants. These soils do not produce commercial forest stands in Anderson County.

WOODLAND GROUP 5c0

This group consists of nearly level to strongly sloping, poorly drained to well-drained loamy and clayey soils on uplands. Permeability is very slow to slow, and the available water capacity is high.

Commercial stands of forest trees cannot be maintained with an acceptable level of management. Scattered, individual loblolly pine and shortleaf pine grow on these soils, but stands of these trees are rare. Stands of trees are more commonly post oak, elm, and blackjack oak.

WOODLAND GROUP 5s3

Arenosa fine sand, 1 to 8 percent slopes, is the only soil in this group. This well-drained sandy soil is gently sloping to sloping and is on uplands. Permeability is very rapid, and the available water capacity is low.

Plant competition is slight and is mainly in abandoned fields where persimmon and sassafras form large thickets. Woodland areas grow mostly sandjack oak, blackjack oak, and post oak (fig. 20).

WOODLAND GROUP 5s0

This group consists of deep, nearly level to gently sloping, moderately well drained to well drained sandy

Figure 19.—**Typical pine forest on Bowie fine sandy loam, 3 to 8 percent slopes, woodland group 3ol. Trees are ready for selective cutting in this well-managed woodland.**

soils on uplands. Permeability is moderately slow to moderate, and the available water capacity is low.

These soils do not produce commercial forest stands in Anderson County.

WOODLAND GROUP 5o0

This group consists of nearly level to sloping, poorly drained to well-drained loamy and sandy soils on uplands. Permeability is very slow to moderate, and the available water capacity is high.

These soils do not produce commercial forest stands, and they generally are west of the commercial pine forest area.

Production of forage

Ranching and livestock farming are important enterprises in Anderson County. Cash receipts to farmers and ranchers for livestock and livestock products exceeded 7.7 million dollars in 1969. Sixty thousand cattle foraged on the grassland and woodland of the county that same year.

The main source of forage for cattle is improved pasture. Most farms and ranches, however, also have woodlands that contribute significantly to the total forage needs of livestock. In most instances, woodlands have an understory plant community composed of grasses, grasslike plants, forbs, and shrubs valuable for grazing. These plants receive no cultural treatment. Their composition and production is largely determined by kind of soil, soil moisture, overstory canopy, and grazing management. These woodlands can be grazed by livestock, big game animals, and other wildlife without significantly affecting other forest values.

More than 127,000 acres of woodland is grazed in the county. In its original state, about 50,000 acres of the county was a savanna. Savannas are native grasslands transitional between prairies and true forest and have scattered trees growing singly or in motts. Savannas occur on sand outliers of the forested area where soil moisture is favorable for the growth of trees, shrubs, and the dominant grasses of the prairie. Post oak, blackjack oak, red oak, hickory, and several kinds of underbrush are characteristic of this savanna and originally shaded about 25 to 30 percent of the ground. The bluestems, indiangrass, switchgrass, purpletop, beaked panicum, and Florida paspalum are typical plants of the herbaceous understory.

Since the introduction of domestic livestock to this area, the native grasses have been reduced by grazing and oak trees and underbrush have increased to the extent that these savannas now resemble true forest. In this survey, they are treated as woodlands.

In evaluating the grazing potential of any forest soil, the percentage of canopy is a very significant factor. If the open canopy shades 0 to 25 percent of the area, many soils on uplands have the potential to produce several thousand pounds of forage per acre. Some of the more important plants that grow under an open canopy are little bluestem, pinehill bluestem, indiangrass, switchgrass, beaked panicum, big bluestem, Florida paspalum, and several introduced grasses. These grasses decrease in competition as the percentage of canopy increases. Shade-tolerant grasses such as longleaf uniola begin to dominate the understory if the canopy approaches or exceeds 50 percent.

On many bottom lands, such shade-tolerant native grasses as sedges, wildryes, switchcane, and others produce several thousand pounds of high quality cool-season forage during the dormant period of the deciduous overstory. Where the canopy is less than 25 percent, warm-season plants, such as common bermudagrass and carpetgrass, often replace the cool-season plants. In some instances, fescue is seeded on the bottom lands and maintained through grazing management.

Because the quantity and quality of forage production is greatly influenced by the amount of light the plants receive during the growing season, four canopy classes are used in the evaluation of understory production.

Overstory canopy classes	*Approximate percentage of shaded ground at midday*
Open	0 to 20
Sparse	21 to 35
Medium	36 to 55
Dense	56 or more

Woodland grazing groups

The soils in Anderson County have been assigned to nine woodland grazing groups to help evaluate woodland for a secondary use, the production of forage for livestock and wildlife.

Figure 20.—**Thin, scrubby stand of oaks affected by drought on Arenosa fine sand, 1 to 8 percent slopes.**

A grazing group is a distinctive kind of forest land that differs from other kinds of forest land in the potential to produce native plants suitable for grazing and wildlife use.

The criteria for differentiating grazing groups are based on:

1. Significant differences in the kinds and proportions of understory plants in the potential plant community.
2. Significant differences in the yield of understory vegetation in the potential plant community.

Four forage value ratings are used to further evaluate vegetation that can be reached by grazing animals.

Forage value	*Minimum percent primary species*
Very high	51 plus
High	31 to 50
Moderate	11 to 30
Low	0 to 10

These ratings are an expression of the present state of vegetation within reach of grazing animals in relation to the potential for that specific grazing group. The rating is based upon the percent of total yield (from the surface to a height of 4½ feet) that is contributed by primary plants.

Primary plants are those that normally produce the desirable quantity and quality of forage for a specific kind of animal. They generally decrease under continuous heavy grazing use. Perennial introduced grasses, such as bermudagrass, dallisgrass, and tall fescue, are considered primary plants where they are adapted and where they produce high-quality forage.

Secondary plants are those that do not produce optimum quality forage for a specific kind of grazing animal. These plants may temporarily increase and then decrease as heavy grazing continues.

Low-value plants are those that do not produce the desired quality of vegetation for a given kind of grazing animal. Because of their low preference, they may continue to increase where the more palatable plants are heavily grazed.

BLACKLAND GRAZING GROUP

This grazing group consists of clayey and loamy, poorly drained to well drained soils that are nearly level to sloping. The available water capacity is high.

The overstory is mainly hardwood trees, and the understory is shrub and herbaceous vegetation. Underbrush consists of winged elm, locust, pricklyash, osage-orange, and hawthorn.

The primary plants are indiangrass, little bluestem, switchgrass, big bluestem, Florida paspalum, Virginia wildrye, and Maximilian sunflower. The secondary plants are silver bluestem, meadow dropseed, Texas wintergrass, vine-mesquite, longspike tridens, low-growing panicums, sedges, brownseed paspalum, prairie-clover, snoutbean, and wildbean.

The plants that have low grazing value are Texas grama, windmillgrass, western ragweed, croton, snow-on-the-prairie, broomweed, fogfruit, tumblegrass, annual grasses, annual weeds, and woody plants.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 2,500 pounds; under sparse canopy, 2,500 to 4,500 pounds; and under an open canopy, 4,500 to 6,000 pounds.

CLAYEY BOTTOMLAND GRAZING GROUP

This grazing group consists of clayey, somewhat poorly drained to moderately well drained soils that are nearly level. These soils are occasionally flooded to frequently flooded, and their available water capacity is high.

Understory vegetation is mainly hawthorn, greenbrier, cow-itch vine, and eastern hophornbeam.

The primary plants are sedges, Virginia wildrye, beaked panicum, switchgrass, longleaf uniola, giant cane, and eastern gamagrass. The secondary plants are redtop panicum, nimblewill, twoflower melic, meadow dropseed, low-growing panicum, and low-growing paspalums. The plants that have low grazing value are broomsedge bluestem, bushy bluestem, sumpweed, blood ragweed, annual grasses, and legumes.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 1,000 to 1,500 pounds; under medium canopy, 1,500 to 3,000 pounds; under sparse canopy, 3,000 to 6,000 pounds; and under an open canopy, 6,000 to 9,000 pounds.

DEEP SAND GRAZING GROUP

Arenosa fine sand, 1 to 8 percent slopes, is the only soil in this group. This well-drained soil is gently sloping to sloping. The available water capacity is low.

Understory vegetation is sparse stands of wild plum, hawthorn, winged elm, and persimmon (fig. 21). In only a few places does tree canopy shade more than 30 percent of the ground. Productivity of the understory vegetation is extremely low under all conditions. Overgrazing reduces production by further decreasing the number of understory plants. Red lovegrass, snakecotton, bullnettle, yankeeweed, and queensdelight characterize this site where it is in a deteriorated condition.

The primary plants are slender indiangrass, little bluestem, sand lovegrass, purpletop, and pinehill bluestem. The secondary plants are low-growing panicums, low-growing paspalums, woolly sheath three-awn, splitbeard bluestem, purple lovegrass, sand dropseed, spiderwort, and hairy grama. The plants that have low grazing value are curly three-awn, pricklypear, snakecotton, purple sandgrass, yankeeweed, queensdelight, yucca, rushfoil, red lovegrass, bullnettle, annual grasses, and legumes.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 1,500 pounds; under sparse canopy, 1,500 to 2,500 pounds; and under an open canopy, 2,500 to 4,000 pounds.

FLATWOODS GRAZING GROUP

This grazing group consists of sandy and loamy, poorly drained soils that are nearly level to gently sloping. The available water capacity ranges from low to high.

Understory vegetation is dense and is composed mainly of sweet myrtle and hawthorn. Carpetgrass invades rapidly wherever overgrazing occurs.

The primary plants are indiangrass, big bluestem, little bluestem, pinehill bluestem, beaked panicum, eastern gamagrass, silver plumegrass, Florida paspalum, catclaw sensitivebrier, longleaf uniola, and Virginia wildrye. The secondary plants are sedges, low-growing panicum, broadleaf uniola, longspike tridens, lespedezas, Carolina jointtail, redtop panicum, nimblewill, twoflower melic, and cutover muhly. The plants that have low grazing value are carpetgrass, broomsedge bluestem, slim aster, bushy bluestem, berry vines, waxmyrtle, peppervine, poison-oak, gallberry, Carolina jessamine, and annuals.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 3,000 pounds; under sparse canopy, 3,000 to 5,000 pounds; and under an open canopy, 5,000 to 8,000 pounds.

Figure 21.—**Native vegetation on Arenosa fine sand, 1 to 8 percent slopes. Trees are mostly sandjack oak, and grasses are mostly bluestem.**

LOAMY BOTTOMLAND GRAZING GROUP

This grazing group consists of loamy, poorly drained to well-drained soils that are nearly level and are subject to flooding. The available water capacity is high. These soils are mostly in narrow delineations and are difficult to manage efficiently.

Understory vegetation is mainly elm, locust, hawthorn, blue beech, Alabama supplejack, and greenbrier.

The primary plants are Virginia wildrye, plumegrass, sedges, beaked panicum, switchgrass, eastern gamagrass, and switchcane. The secondary plants are low-growing panicums, low-growing paspalums, redtop panicum, twoflower melic, nimblewill, white tridens, longspike tridens, perennial legumes, and longleaf uniola. The plants that have low grazing value are vaseygrass, palmetto, sumpweed, broomsedge bluestem, blood ragweed, berry vines, and poison-oak.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 3,000 pounds; under sparse canopy, 3,000 to 5,000 pounds; and under an open canopy, 5,000 to 8,000 pounds.

REDLAND GRAZING GROUP

This grazing group consists of loamy, moderately well drained to well drained soils that are nearly level to moderately steep. The available water capacity is low to high.

The understory vegetation, which varies from moderate to sparse, is made up of winged elm, honeylocust, sweetgum, pricklyash, pricklypear, hackberry, eastern redcedar, and American beautyberry.

The primary plants are big bluestem, indiangrass, little bluestem, pinehill bluestem, beaked panicum, Florida paspalum, sand lovegrass, Mississippi dropseed, and purpletop.

The secondary plants are side-oats grama, longleaf uniola, low-growing panicums, low-growing paspalums, meadow dropseed, sedges, silver bluestem, and plains lovegrass. The plants that have low grazing value are western ragweed, arrowfeather three-awn, broomsedge bluestem, berry vines, poison-oak, broomweed, curlycup gumweed, goldenrod, annual grasses, and legumes.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 2,000 pounds; under sparse canopy, 2,000 to 3,500 pounds; and under an open canopy, 3,500 to 6,000 pounds.

SANDY GRAZING GROUP

This grazing group consists of sandy, somewhat poorly drained to somewhat excessively drained soils that are nearly level to moderately steep. The available water capacity is low to moderate.

Understory vegetation is mostly yaupon, winged elm, hawthorn, eastern redcedar, sumac, and American beautyberry. Grapevine, greenbrier, and cow-itch vine are common.

The primary plants are little bluestem, pinehill bluestem, indiangrass, slender indiangrass, purpletop, Florida paspalum, and big bluestem. The secondary plants are longleaf uniola, low-growing panicums, fringeleaf paspalum, hairy dropseed, purple lovegrass, pineywoods dropseed, and pitchfork paspalum. The plants that have low grazing value are arrowfeather three-awn, red lovegrass, yankeeweed, beautyberry, yaupon, berry vines, and poison-ivy.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,500 pounds; under medium canopy, 1,500 to 3,000 pounds; under sparse canopy, 3,000 to 4,500 pounds; and under an open canopy, 4,500 to 6,000 pounds.

SANDY LOAM GRAZING GROUP

This grazing group consists of loamy to sandy, somewhat poorly drained to well-drained soils that are nearly level to moderately steep. The available water capacity is moderate to high.

The understory vegetation is mostly pricklyash, osageorange, American beautyberry, beech, chinquapin, winged elm, blue beech, and sumac. It is dense and is knit together with many kinds of vines, such as Alabama supplejack, greenbrier, honeysuckle, grapevine, and cow-itch vine. Exceptions to this condition are in areas that have a long history of fire or heavy grazing, in areas where chemical control methods have been used, and in pine plantations established in the last 30 years.

Pine plantation understory may be pure pine reproduction, a mat of pine needles and hardwood leaves, or grass. Canopy affects the production of grasses and forbs least under longleaf pine, moderately under shortleaf, and the most under well-stocked stands of loblolly pine.

The primary plants are pinehill bluestem, little bluestem, beaked panicum, switchgrass, indiangrass, big bluestem, sprawling panicum, swamp sunflower, Florida paspalum, and purpletop. The secondary plants are brownseed paspalum, pineywoods dropseed, purple lovegrass, Carolina jointtail, low-growing panicums, low-growing paspalums, sedges, longleaf uniola, blackseed needlegrass, fall witchgrass, splitbeard bluestem, legumes, and forbs. The plants that have low grazing value are red lovegrass, broomsedge bluestem, yankeeweed, poison-ivy, arrowfeather three-awn, pencilflower, cutover muhly, flameleaf sumac, wild-indigo, rough coneflower, carpetgrass, vaseygrass, annuals, and curlycup gumweed.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 3,000 pounds; under sparse canopy, 3,000 to 4,500 pounds; and under an open canopy, 4,500 to 7,000 pounds.

TIGHT SANDY LOAM GRAZING GROUP

This grazing group consists of loamy, poorly drained to well-drained soils that are nearly level to strongly sloping. The available water capacity is high.

The understory vegetation may contain yaupon, pricklyash, osageorange, American beautyberry, beech, chinquapin, winged elm, blue beech, and sumac. In some places the understory is knit together with such plants as greenbrier, grapevine, Alabama supplejack, honey-

suckle, yellow jessamine, and peppervine. Exceptions to this condition are in areas with a long history of fire or heavy grazing, in areas where chemical control methods have been used, and in pine plantations established within the last 30 years. Pine plantation understory may be pure pine reproduction, a mat of pine needles and hardwood leaves, or grass. The effect of canopy on herbaceous vegetation is moderate under shortleaf pine and severe under well-stocked stands of loblolly pine.

The primary plants are little bluestem, indiangrass, beaked panicum, big bluestem, sprawling panicum, swamp sunflower, Florida paspalum, and purpletop. The secondary plants are brownseed paspalum, purple lovegrass, pineywood dropseed, Carolina jointtail, low-growing panicum, low-growing paspalums, sedges, longleaf uniola, blackseed needlegrass, splitbeard bluestem, legumes, and forbs. The plants that have low grazing value are red lovegrass, yankeeweed, broomsedge bluestem, poison-ivy, arrowfeather three-awn, cutover muhly, flameleaf sumac, wild-indigo, rough coneflower, carpetgrass, vaseygrass, and annuals.

Where this site is in excellent condition, the potential annual acre yield of air-dry herbage under a dense canopy ranges from 500 to 1,000 pounds; under medium canopy, 1,000 to 2,500 pounds; under sparse canopy, 2,500 to 3,500 pounds; and under an open canopy, 3,500 to 4,700 pounds.

Use of the Soils for Wildlife

Fish and wildlife resources are of great economic importance to landowners in Anderson County. Many holdings are leased for hunting and fishing rights, chiefly to out-of-county residents. The main kinds of wildlife in the county are whitetail deer, turkey, cat squirrel, fox squirrel, bobwhite quail, dove, cottontail rabbit, jackrabbit, and numerous kinds of nongame birds. Also present are raccoon, fox, beaver, skunk, opossum, and other furbearers. Common predators are bobcat, timber wolf, and coyote. Alligators are in some streams and lakes. Streams, lakes, ponds, and grain fields attract ducks and geese during migration. Most farm and ranch ponds are stocked with channel catfish, black bass, and sunfish. The Trinity River and the Neches River also afford good fishing.

Successful management of wildlife on any tract of land requires that food, cover, and water be available in a suitable combination. Lack of any one of these necessities, an unfavorable balance between them, or an inadequate distribution of them may severely limit or account for the absence of a desired kind of wildlife. Soil information provides a valuable tool in planning, improving, or maintaining suitable food, cover, and water for wildlife.

Table 5 shows the suitability of each soil in the county for elements of wildlife habitat and kinds of wildlife.

Most wildlife habitat is managed by planting suitable vegetation, by manipulating existing vegetation to bring about a natural establishment of, an increase in, or an improvement in desired plants, or by combinations of such measures. The influence of a soil on plant growth is known for many kinds of soils and can be inferred for others from a knowledge of soil characteristics and behavior. In addition, water areas can be created or natural ones improved as wildlife habitat.

Soil interpretations for wildlife habitat are useful in selecting the more suitable sites for various kinds of management. They also serve as indicators of the level of management intensity needed to achieve satisfactory results, and they show why it may not be feasible to manage a particular area for a given kind of wildlife. These interpretations may also serve as a basis for broad-scale planning of wildlife management areas, parks, and nature areas, or for acquiring wildlife land.

These soil properties affect the growth of wildlife habitat: (1) thickness of soil, (2) texture of the surface layer, (3) available water capacity to a depth of 40 inches, (4) wetness, (5) surface stoniness or rockiness, (6) flooding hazard, and (7) slope.

The soil areas shown on the soil survey maps are rated without regard to positional relationships with adjoining delineated areas. The size, shape, or location of the outlined area does not affect the rating. Certain influences on habitat, such as elevation and aspect, must be appraised onsite.

The ratings shown in table 5 are based on the characteristics or behavior of the soil. Four levels of suitability are recognized. The levels of suitability are expressed as *good, fair, poor,* and *very poor.*

Good means that habitat generally is easily improved, maintained, or created. The soil has few if any limitations that affect management, and satisfactory results can be expected.

Fair means that habitat can be improved, maintained, or created in most places, but the soil has moderate limitations that affect management or development. A moderate intensity of management and fairly frequent attention may be required for satisfactory results.

Poor means that habitat can be improved, maintained, or created in most places, but the soil has severe limitations. Management may be difficult, expensive, and require intensive effort. Results are questionable.

Very poor means that it is impractical or impossible to attempt to improve, maintain, or create habitats. Unsatisfactory results are probable.

The seven habitat elements considered in table 5 are defined in the paragraphs that follow.

Grain and seed crops are agricultural grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghums, millet, rye, sesame, oats, and sunflower.

Grasses and legumes are domestic perennial grasses and legumes that can be established by planting and which furnish food and cover for wildlife. Examples are Coastal bermudagrass, ryegrass, fescue, and panicgrasses. Legumes include clover, annual lespedeza, bush lespedeza, cowpea, singletary pea, and vetch.

Wild herbaceous plants are perennial grasses, forbs, and weeds that provide food and cover for wildlife. Examples of these are beggarweed, perennial lespedeza, wildbean, indiangrass, wildryegrasses, partridgepea, wildpea, croton, and pokeberry.

Hardwood trees and shrubs are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, or foliage (browse) used extensively as food by wildlife. These plants commonly become established

TABLE 5.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*

Soil series and map symbols	Wildlife habitat elements							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Openland	Woodland	Wetland
Alto: AfB, AlA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Arenosa: ArD	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Axtell:										
AtB	Fair	Fair	Good	Good	Good	Poor	Very poor	Fair	Good	Poor.
AtC2	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
AtE	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
AwA	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
For Wrightsville part of AwA, see Wrightsville series.										
Bernaldo: BeA	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Bowie:										
BoB	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
BoD	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Bub	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Mapped only with Trawick soils.										
Burleson: Bu	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
Chipley: ChC	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
Darco: DaD, DkF	Poor	Poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
For Kirvin and Tenaha parts of DkF, see Kirvin (KlF) and Tenaha series.										
Dougherty: DoC	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Elrose:										
ElB	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
ElD, ElE	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Eustis: EuD	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Ferris: FcD2	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Freestone:										
FrA	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	Fair.
FrC	Good	Good	Good	Good	Good	Poor	Poor	Good	Fair	Poor.
Fs	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
For Lufkin part of Fs, see Lufkin series.										
Fuquay: FuB, FuD	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Galey: GaB	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Garner: Gc	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Hannahatchee: Ha	Poor	Fair	Fair	Good	Fair	Fair	Very poor	Fair	Good	Poor.
Heiden: HeD	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Kaufman:										
Ka	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Kc	Poor	Fair	Fair	Good	Fair	Fair	Poor	Fair	Good	Fair.
Kenney KeC	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Kirvin:										
KfD, KnE	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
For Sacul part of KnE, see Sacul series.										
KlF, KmD	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
KrF	Poor	Fair	Fair	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Konawa:										
KsC	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
KtD2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Kullit: KuB	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Larue: LaB, LaD	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Leefield: LeC	Poor	Fair	Good	Fair	Fair	Fair	Very poor	Fair	Fair	Poor.
Lufkin: LuA	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
Nahatche: Na	Poor	Fair	Fair	Good	Fair	Fair	Poor	Fair	Good	Fair.
For Wehadkee part of Na, see Wehadkee series.										
Nimrod: NdB	Poor	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
Normangee:										
NoB	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
NoD	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Pelham: PeC	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
Robinsonville: Ro	Poor	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Good	Very poor.
Sacul: SaC	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Stidham: SmC	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.

TABLE 5.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soil series and map symbols	Wildlife habitat elements							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Openland	Woodland	Wetland
Susquehanna:										
SsC	Good	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
SuD2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Tenaha: Mapped only with Darco and Kirvin soils.	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Thenas: Th	Poor	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
Trawick:										
TkD, TkF	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
TmF	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
For Bub part of TmF, see Bub series.										
Trep: TpC	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Trinity: Tr	Poor	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair.
Wehadkee: Mapped only with Nahatche soils.	Very poor.	Fair	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
Wilson: WlB	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wrightsville: Wr	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

through natural processes, but they may be planted. Examples are oak, hickory, pecan, mesquite, American beautyberry, yaupon, wild grape, haw, honeysuckle, greenbrier, persimmon, wild plum, and multiflora rose.

Coniferous woody trees are cone-bearing trees and shrubs that are used mainly as cover but may furnish food in the form of browse, seeds, or fruitlike cones. They become established through natural processes or may be planted. Examples are pine, cedar, juniper, or ornamentals.

Wetland food and cover plants include annual and perennial, wild, herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover that is extensively and dominantly used by wetland forms of wildlife. Examples are smartweed, wild millet, barnyardgrass, bulrush, rushes, sedges, burreed, wildrice, cutgrass, sourdock, and cattail.

Shallow water developments are low dikes and water-control structures established to create habitat principally for waterfowl. They can be designed so that they can be drained, planted, and flooded, or they can be used as permanent impoundments to grow submerged aquatics. Both freshwater and brackish water developments are included.

The three general kinds of wildlife, as shown in table 5, are defined in the following paragraphs.

Openland wildlife refers to birds and mammals that normally frequent cropland, pastures, and areas overgrown with grasses, forbs, and shrubby growth. Examples of this kind of wildlife are bobwhite quail, dove, fox, coyote, armadillo, cottontail rabbit, jackrabbit, and meadow lark.

Woodland wildlife consists of birds and mammals that normally frequent wooded areas of pine trees, hardwood trees, and shrubs. Examples of woodland wildlife are deer, turkey, squirrel, raccoon, fox, and wolf.

Wetland wildlife refers to birds and mammals that normally frequent such areas as ponds, streams, ditches, marshes, and swamps. Examples of this kind of wildlife are duck, geese, rail, shorebirds, and snipe.

Soils and Engineering [4]

This section provides information of special interest to engineers, contractors, farmers, and others who use soil as structural material or as foundation material upon which structures are built. In this section are discussed those properties of the soils that affect construction and maintenance of roads, airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. Among the soil properties most important in engineering are permeability, compressibility, shear strength, consolidation potential, shrink-swell potential, water-holding capacity, plasticity, reaction, grain-size distribution, and density.

Information concerning these and related soil properties is furnished in tables 6 and 7. The estimates and interpretations of soil properties in these tables can be used in—

1. Planning agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and other structures for controlling water and conserving soil.
2. Selecting potential locations for highways, airports, pipelines, and underground cables.
3. Locating probable sources of sand, gravel, or rock suitable for use as construction material.
4. Selecting potential industrial, commercial, residential, and recreational areas.

The engineering interpretations reported here do not eliminate the need for sampling and testing at the site

[4] By JOE T. ROGERS, civil engineer, Soil Conservation Service.

TABLE 6.—*Estimates of soil*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other series in the first column of this

Soil series and map symbols	Hydrologic group	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Percentage passing sieve
					Unified	AASHO	No. 4 (4.7 mm)
		Feet	*Inches*				
Alto: AfB, AlA	C	3–4	0–8	Fine sandy loam	SC or SM	A–2–4 or A–4	95–100
			8–68	Clay loam and clay.	CL or SC	A–6 or A–7	95–100
			68–80	Clay	CL or SC	A–6 or A–7	80–95
Arenosa: ArD	A	>10	0–108	Fine sand	SM, SP–SM	A–2–4	—
*Axtell: AtB, AtC2, AtE, AwA	D	>10	0–6	Fine sandy loam	SM	A–2 or A–4	95–100
For Wrightsville part of AwA, see Wrightsville series.			6–82	Clay	CH	A–7	95–100
Bernaldo: BeA	B	4–6	0–30	Fine sandy loam	ML	A–4	100
			30–84	Sandy clay loam	CL	A–6	—
Bowie: BoB, BoD	B	8–20	0–13	Fine sandy loam	SM	A–2–4	100
			13–75	Sandy clay loam	CL or SC	A–6	90–100
Bub	C	>10	0–4	Gravelly clay loam.	SM, SC, GM, GC, CL	A–6, A–4	65–75
Mapped only with Trawick soils.			4–18	Clay	CL, CH	A–7	65–85
			18–28	Partly weathered glauconite.			
Burleson: Bu	D	>10	0–70	Clay	CH	A–7–6	100
Chipley: ChC	C	2–5	0–82	Fine sand	SM or SP	A–2–4 or A–3	—
*Darco: DaD, DkF	A	5–9	0–49	Fine sand	SM	A–2–4	—
For Kirvin and Tenaha parts of DkF, see Kirvin and Tenaha series.			49–67	Sandy clay loam	SC	A–6	100
			67–80	Sandy loam	SM	A–2 or A–4	100
Dougherty: DoC	A	>10	0–34	Loamy fine sand	SM	A–2 or A–4	—
			34–66	Sandy clay loam	SC or CL	A–6	—
			66–76	Sandy loam	SM or ML	A–4	—
			76–90	Loamy sand and sandy loam.	SM	A–2 or A–4	—
Elrose: ElB, ElD, ElE	B	>10	0–10	Fine sandy loam	SM	A–4 or A–2	95–100
			10–68	Sandy clay loam	SC	A–4 or A–6	95–100
			68–90	Sandy loam and loamy fine sand.	SM or SC	A–2–4 or A–4	90–100
Eustis: EuD	A	>10	0–21	Fine sand	SP–SM	A–2–4 or A–3	—
			21–69	Loamy fine sand	SM	A–2–4	—
			69–80	Fine sand	SP–SM	A–2–4 or A–3	—
Ferris: FcD2	D	>10	0–42	Clay	CH	A–7–6	95–100
			42–60	Sandy loam	SM or SC	A–2–4 or A–4	90–100
*Freestone: FrA, FrC, Fs	C	2–4	0–12	Fine sandy loam	SM or ML	A–4	—
For Lufkin part of Fs, see Lufkin series.			12–46	Sandy clay loam or clay loam.	SC or CL	A–6	100
			46–100	Clay or clay loam.	CL or CH	A–7	95–100
Fuquay: FuB, FuD	B	>10	0–30	Loamy fine sand	SM	A–2	—
			30–106	Sandy clay loam	SC or CL	A–6	—

See footnote at end of table.

properties significant in engineering

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow care-
table. The symbol > means more than, the symbol < means less than]

Percentage passing sieve—Continued			Permea-bility	Available water capacity	Reaction	Shrink-swell potential	Corrosivity class and contributing soil features [1]	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
90–95	80–90	30–45	0.63–2.0	0.10–0.15	6.1–7.3	Low	Moderate: clay loam.	Moderate: clay loam; pH is 5.1 to 6.5.
85–95	80–90	45–55	0.2–0.63	0.15–0.20	5.1–6.5	Moderate.		
65–85	60–75	36–55	0.2–0.63	—	5.6–7.8	Moderate.		
100	70–100	5–20	>20	0.05–0.08	5.6–7.3	Low	Low	Moderate: pH is 5.6 to 7.3.
90–100	80–90	30–50	0.63–2.0	0.10–0.15	5.1–6.5	Low	High: clay	High: clay; pH is 4.5 to 8.4.
90–100	80–100	51–75	<0.06	0.12–0.16	4.5–8.4	High.		
95–100	90–100	51–65	2.0–6.3	0.10–0.15	5.6–6.5	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.6 to 6.5.
100	90–100	60–75	0.63–2.0	0.12–0.17	5.6–6.5	Low.		
98–100	95–100	25–35	2.0–6.3	0.10–0.15	5.6–6.5	Low	Moderate: sandy clay loam.	High: sandy clay loam; pH is 4.5 to 6.0.
90–100	85–100	40–55	0.2–0.63	0.12–0.17	4.5–6.0	Low.		
60–75	55–70	45–65	0.2–0.63	0.08–0.18	5.6–6.5	Low	Moderate: clay.	Moderate: clay; pH is 5.6 to 6.5.
65–85	60–85	51–75	0.2–0.63	0.14–0.18	5.6–6.5	Moderate.		
95–100	85–100	80–95	<0.06	0.12–0.18	5.6–8.4	High	High: clay	Low.
100	50–75	4–20	6.3–20	0.05–0.10	4.5–5.5	Low	Low	High: fine sand; pH is 4.5 to 5.5.
100	60–75	15–30	6.3–20	0.05–0.10	4.5–6.5	Low	Low	High: sandy clay loam; pH is 4.5 to 6.5.
95–100	80–90	36–50	2.0–6.3	0.12–0.15	4.5–5.5	Low.		
95–100	75–85	20–40	2.0–6.3	0.10–0.12	4.5–5.5	Low.		
100	50–90	30–50	6.3–20	0.06–0.09	5.6–6.5	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.1 to 6.5.
100	90–100	40–60	0.63–2.0	0.12–0.16	5.1–6.5	Low.		
100	90–100	40–55	2.0–6.3	0.09–0.13	5.1–6.5	Low.		
100	50–90	30–50	2.0–6.3	0.06–0.09	5.1–6.5	Low.		
90–95	70–85	30–40	2.0–6.3	0.10–0.15	5.1–6.5	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.1 to 6.0.
90–95	80–90	36–50	0.63–2.0	0.13–0.18	5.1–6.5	Low.		
80–90	75–80	25–40	2.0–6.3	0.10–0.16	4.5–6.5	Low.		
100	50–70	5–12	6.3–20	0.05–0.08	4.5–5.5	Low	Low	High: loamy fine sand; pH is 4.5 to 5.5.
100	65–90	15–25	2.0–6.3	0.08–0.10	4.5–5.5	Low.		
100	60–80	5–12	6.3–20	0.05–0.08	4.5–5.0	Low.		
95–100	80–95	75–95	<0.06	0.15–0.18	7.9–8.4	High	High: clay	Low.
80–90	75–80	25–40	2.0–6.3	0.10–0.16	7.9–8.4	Low.		
100	70–85	40–55	0.63–2.0	0.10–0.15	6.1–6.5	Low	High: clay; wetness.	Moderate: clay; pH is 4.5 to 6.0.
95–100	80–90	45–70	0.2–0.63	0.12–0.17	4.5–6.0	Moderate.		
85–95	80–95	60–85	0.06–0.2	0.12–0.18	5.6–7.3	High.		
100	50–75	15–30	6.3–20	0.07–0.09	4.5–5.5	Low	Moderate: sandy clay loam.	High: sandy clay loam; pH is 4.5 to 5.5.
100	80–90	36–55	0.06–0.2	0.14–0.16	4.5–5.5	Low.		

TABLE 6.—*Estimates of soil properties*

Soil series and map symbols	Hydrologic group	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Percentage passing sieve
					Unified	AASHO	No. 4 (4.7 mm)
		Feet	*Inches*				
Galey: GaB	B	>10	0–11	Fine sandy loam	SM	A–4, A–2	—
			11–72	Sandy clay loam	SC or CL	A–4 or A–6	—
Garner: Gc	D	2–6	0–82	Clay	CH	A–7–6	100
Hannahatchee: Ha	B	2–4	0–20	Fine sandy loam	SM or SM–SC	A–4	—
			20–35	Sandy clay loam	CL	A–6	100
			35–56	Sandy loam	SM or SM–SC	A–4	100
			56–80	Sandy clay loam with many concretions.			
Heiden: HeD	D	>10	0–56	Clay	CH	A–7–6	95–100
Kaufman: Ka, Kc	D	>10	0–72	Clay	CH	A–7	—
Kenney: KeC	A	>10	0–44	Loamy fine sand	SM or SP–SM	A–2–4	—
			44–72	Sandy clay loam	SC or CL	A–6	—
			72–90	Loamy sand and sandy loam bedded materials.			
*Kirvin: KfD, KlF, KmD, KnE, KrF. For Sacul part of KnE, see Sacul series.	C	>10	0–12	Fine sandy loam	SM	A–4	90–95
			12–24	Clay	CL or CH	A–7	95–100
			24–50	Clay loam	CL	A–6 or A–7	—
			50–60	Clay loam and loam.			
Konawa: KsC, KtD2	B	>10	0–9	Fine sandy loam	SM	A–4	—
			9–34	Sandy clay loam	SC or CL	A–6	—
			34–48	Sandy loam	SM or ML	A–2 or A–4	—
			48–60	Loamy sand	SM	A–2, A–4	—
Kullit: KuB	B	2–5	0–9	Fine sandy loam	SM or ML	A–2 or A–4	—
			9–36	Clay loam and loam.	CL or SC	A–6	—
			36–66	Clay	CH or CL	A–7	—
			66–85	Shaly clay	CH	A–7	—
Larue: LaB, LaD	A	>10	0–26	Loamy fine sand	SM	A–2	—
			26–72	Sandy clay loam	SM or SC	A–2 or A–4	—
			72–84	Sandy clay loam	SM or SC	A–2 or A–4	—
Leefield: LeC	C	2–5	0–35	Loamy fine sand	SM or SP–SM	A–2	95–100
			35–65	Sandy clay loam	SC	A–2 or A–6	95–100
			65–74	Sandy loam	SM	A–2 or A–4	95–100
Lufkin: LuA	D	1–4	0–7	Fine sandy loam	SM or ML	A–4	95–100
			7–38	Clay	CH	A–7	95–100
			38–64	Sandy clay	CL or CH	A–7	90–100
*Nahatche: Na For Wehadkee part of Na, see Wehadkee series.	C	1–4	0–19	Clay loam	CL	A–6 or A–7	—
			19–29	Loam	CL or ML	A–6	—
			29–83	Clay loam and sandy clay loam.	CL	A–6 or A–7	—
Nimrod: NdB	C	2–4	0–28	Loamy fine sand	SM or SP–SM	A–2	—
			28–44	Sandy clay loam and clay loam.	SC	A–2 or A–6	—
			44–74	Clay	CL	A–7	—
			74–96	Clay loam and sandy clay loam.	SC	A–2 or A–6	—

See footnote at end of table.

significant in engineering—Continued

Percentage passing sieve—Continued			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity class and contributing soil features [1]	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	50–90	30–50	0.63–2.0	0.10–0.14	5.6–7.3	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.1 to 6.0.
100	90–100	40–60	0.63–2.0	0.12–0.16	5.1–6.0	Low.		
95–100	95–100	80–90	<0.06	0.12–0.18	5.6–8.4	High	High: clay; wetness.	Moderate: clay; pH is 5.6 to 8.4.
100	70–85	36–50	2.0–6.3	0.11–0.15	5.6–7.3	Low	Moderate: sandy loam.	Moderate: sandy loam; pH is 5.6 to 7.3.
95–100	80–90	51–65	0.63–2.0	0.12–0.17	5.6–7.3	Moderate.		
95–100	60–70	36–50	0.63–2.0	0.10–0.15	5.6–7.3	Low.		
95–100	80–95	75–95	<0.06	0.12–0.18	7.9–8.4	High	High: clay	Low.
100	95–100	90–95	<0.06	0.12–0.18	6.1–8.4	High	Very high: clay; wetness.	Low.
100	50–75	10–20	6.3–20	0.07–0.11	5.1–6.5	Low	Low	Moderate: sandy clay loam; pH is 5.1 to 6.5.
100	80–90	45–55	0.63–2.0	0.12–0.15	5.1–6.5	Low.		
85–90	80–90	36–50	2.0–6.3	0.10–0.15	5.6–6.0	Low	Moderate: clay loam.	High: clay loam; pH is 4.5 to 5.5.
90–95	85–90	51–75	0.2–0.63	0.10–0.15	4.5–5.5	Moderate.		
100	95–100	51–60	0.2–0.63	0.10–0.15	4.5–5.5	Moderate.		
100	70–85	40–50	2.0–6.3	0.10–0.12	5.6–6.5	Low	Low	Moderate: loamy sand; pH is 5.1 to 5.5.
100	90–100	40–60	0.63–2.0	0.12–0.16	5.1–6.0	Low.		
100	90–100	30–60	2.0–6.3	0.09–0.13	5.1–5.5	Low.		
100	50–90	30–50	6.3–20	0.06–0.09	5.6–6.0	Low.		
100	90–100	30–60	2.0–6.3	0.11–0.15	5.1–6.0	Low	High: clay; wetness.	High: clay; pH is 4.5 to 5.5.
100	90–100	40–60	0.63–2.0	0.15–0.20	4.5–5.5	Low.		
100	90–100	51–65	0.06–0.20	0.14–0.18	4.5–5.5	Moderate.		
100	90–100	70–80	0.06–0.20	0.12–0.16	4.5–5.0	Moderate.		
100	50–75	15–30	2.0–6.3	0.07–0.10	5.6–6.5	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.6 to 6.5.
100	80–90	30–45	0.63–2.0	0.12–0.15	5.6–6.5	Low.		
100	60–70	30–40	2.0–6.3	0.12–0.15	5.6–6.5	Low.		
95–100	60–85	10–20	>6.3	0.07–0.10	4.5–6.0	Low	High: sandy clay loam; wetness.	High: sandy clay loam; pH is 4.5 to 5.0.
95–100	70–85	30–50	0.20–0.63	0.12–0.17	4.5–5.0	Low.		
95–100	65–85	30–50	2.0–6.3	0.10–0.15	4.5–5.0	Low.		
95–100	90–100	40–60	0.63–2.0	0.10–0.15	5.1–6.5	Low	High: sandy clay; wetness.	Moderate: sandy clay; pH is 5.1 to 6.5.
95–100	95–100	70–85	<0.06	0.12–0.16	5.1–6.5	High.		
80–100	80–95	51–60	<0.06	0.10–0.13	6.1–7.8	High.		
100	90–100	70–80	0.63–2.0	0.15–0.20	5.6–7.3	Moderate	High: clay loam; wetness.	Moderate: clay loam; pH is 5.6 to 7.3.
100	85–95	60–75	0.63–2.0	0.15–0.20	5.6–7.3	Low.		
100	90–100	70–80	0.63–2.0	0.15–0.20	5.6–7.3	Moderate.		
100	90–100	10–20	2.0–6.3	0.07–0.10	5.1–7.3	Low	High: clay; wetness.	Moderate: clay; pH is 5.1 to 5.5.
100	90–100	20–40	0.2–0.63	0.14–0.18	5.1–6.0	Low.		
100	90–100	75–95	0.2–0.63	0.14–0.18	5.1–5.5	Moderate.		
100	90–100	20–40	0.2–0.63	0.14–0.18	5.6–6.5	Low.		

TABLE 6.—*Estimates of soil properties*

Soil series and map symbols	Hydrologic group	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Percentage passing sieve
					Unified	AASHO	No. 4 (4.7 mm)
		Feet	*Inches*				
Normangee: NoB, NoD	D	>10	0–7	Clay loam	CL or CH	A–7	—
			7–44	Clay	CH	A–7	—
			44–64	Weathered shale.			
Pelham: PeC	D	1–2	0–30	Loamy fine sand	SM or SP–SM	A–2	—
			30–68	Sandy clay loam and sandy loam.	SC	A–2 or A–6	100
Robinsonville: Ro	B	4–6	0–30	Fine sandy loam and sandy loam.	SM or ML	A–4	100
			30–86	Sandy loam over stratified loamy fine sand and fine sandy loam.	SM	A–2 or A–4	100
Sacul: SaC	D	>10	0–8	Fine sandy loam	ML	A–4	100
			8–58	Clay	CH or MH	A–7	—
			58–82	Shaly clay.			
Stidham: SmC	A	>10	0–26	Loamy fine sand	SM	A–2 or A–4	—
			26–72	Sandy clay loam	SC or CL	A–4 or A–6	—
Susquehanna: SsC, SuD2	D	8–10	0–8	Fine sandy loam	SM	A–4	—
			8–68	Clay	CH	A–7	—
			68–80	Shale.			
Tenaha Mapped only with Darco and Kirvin soils.	B	>10	0–26	Loamy fine sand	SM	A–2–4	—
			26–42	Sandy clay loam	SC or CL	A–6	—
			42–60	Stratified clayey, loamy, and sandy materials.			
Thenas: Th	C	2–3	0–32	Fine sandy loam	SM or SC	A–4	—
			32–50	Sandy clay loam	CL	A–6	100
			50–62	Clay loam	CL	A–6	100
			62–84	Sandy clay loam, sandy loam, loamy sand.			
*Trawick: TkD, TkF, TmF For Bub part of TmF, see Bub series.	B	>10	0–5	Fine sandy loam	SM or SC	A–4	80–95
			5–46	Clay	CL or CH	A–7	90–100
			46–59	Clay loam and glauconite.			
Trep: TpC	B	>10	0–24	Loamy fine sand	SM or SP–SM	A–2–4	100
			24–48	Sandy clay loam	SC	A–6	100
			48–74	Sandy clay	CL	A–6	100
Trinity: Tr	D	4–10	0–75	Clay	CH	A–7–6	—
Wehadkee Mapped only with Nahatche soils.	D	0–1	0–58	Sandy clay loam	ML or CL	A–6	—
			58–72	Sandy clay loam and clay loam.	CL	A–6	—
Wilson: WlB	D	1–4	0–6	Clay loam	CL	A–6	95–100
			6–108	Clay and silty clay.	CL or CH	A–7–6	95–100
Wrightsville: Wr	D	1–2	0–12	Silty clay loam and clay loam.	ML or CL	A–6	100
			12–42	Silty clay	MH or CH	A–7	—
			42–56	Clay	CH	A–7	—
			56–74	Clay loam	CL	A–6 or A–7	—

[1] Ratings apply to entire profile.

significant in engineering—Continued

Percentage passing sieve—Continued			Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity class and contributing soil features [1]	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete
			Inches per hour	*Inches per inch of soil*	*pH*			
100	90–100	70–80	0.06–0.20	0.14–0.18	5.6–7.3	Moderate	High: clay	Low.
100	90–100	75–90	<0.06	0.14–0.18	5.6–8.4	High.		
100	85–95	10–20	2.0–6.3	0.07–0.10	4.5–6.0	Low	Moderate: sandy clay loam; wetness.	High: sandy clay loam; pH is 4.5 to 5.0.
95–100	65–90	30–50	0.63–2.0	0.10–0.15	4.5–5.0	Low.		
95–100	85–95	36–55	2.0–6.3	0.11–0.15	6.1–7.3	Low	Low	Low.
95–100	85–95	30–50	2.0–6.3	0.08–0.10	6.1–7.3	Low.		
95–100	85–95	51–70	0.63–2.0	0.10–0.15	4.5–5.5	Low	High: clay; wetness.	High: clay; pH is 4.5 to 5.5.
100	98–100	80–95	0.06–0.2	0.12–0.18	4.5–5.5	High.		
100	50–90	30–50	6.3–20	0.07–0.10	5.1–6.0	Low	Moderate: sandy clay loam.	Moderate: sandy clay loam; pH is 5.1 to 6.0.
100	90–100	40–60	0.63–2.0	0.12–0.16	5.1–6.0	Low.		
100	80–85	45–50	0.63–2.0	0.10–0.15	4.5–5.5	Low	High: clay; wetness.	High: clay pH is 4.5 to 5.5.
100	80–100	75–90	<0.06	0.12–0.18	4.5–5.5	High.		
100	70–85	15–30	6.3–20	0.07–0.10	5.6–7.3	Low	Moderate: sandy clay loam.	High: sandy clay loam; pH is 4.5 to 5.5.
100	80–90	36–55	0.63–2.0	0.12–0.16	4.5–5.5	Low.		
——	100	36–45	2.0–6.3	0.11–0.15	5.1–7.3	Low	Moderate: sandy clay loam; wetness.	Moderate: sandy clay loam; pH is 5.1 to 7.3.
95–100	90–95	60–70	0.63–2.0	0.12–0.17	5.1–7.3	Moderate.		
95–100	90–95	51–65	0.63–2.0	0.15–0.20	5.1–7.3	Moderate.		
80–95	75–85	36–50	0.63–2.0	0.10–0.15	5.6–7.3	Low	High: clay	Moderate: clay; pH is 5.1 to 6.0.
85–95	70–80	51–70	0.2–0.63	0.12–0.18	5.1–6.0	Moderate.		
95–100	90–95	10–20	6.3–20	0.07–0.10	5.1–6.5	Low	Moderate: sandy clay loam; wetness.	High: sandy clay loam; pH is 4.5 to 6.0.
95–100	80–90	40–50	0.63–2.0	0.12–0.15	4.5–6.0	Low.		
95–100	90–95	60–70	0.2–0.63	0.12–0.15	4.5–5.5	Low.		
100	85–100	80–90	<0.06	0.12–0.18	7.4–8.4	High	High: clay; wetness.	Low.
100	96–99	56–84	0.63–2.0	0.12–0.17	4.5–5.5	Low	High: sandy clay loam; wetness.	Moderate: sandy clay loam; pH is 4.5 to 5.5.
100	96–99	56–80	0.63–2.0	0.12–0.17	4.5–5.5	Low.		
95–100	95–100	60–85	0.2–0.63	0.15–0.20	5.6–6.0	Low	High: clay; wetness.	Low.
95–100	95–100	70–90	<0.06	0.15–0.20	5.6–8.4	High.		
95–100	95–100	90–100	0.2–0.63	0.18–0.22	4.5–6.5	Low	High: clay; wetness.	High: clay; pH is 4.5 to 6.5.
100	95–100	90–100	0.06–0.2	0.18–0.21	4.5–6.5	High.		
100	95–100	90–100	0.06–0.2	0.14–0.18	4.5–6.5	High.		
100	95–100	90–100	0.06–0.2	0.15–0.20	5.6–8.4	High.		

TABLE 7.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road fill	Roads and streets	Farm ponds: Reservoir area	Farm ponds: Embankments	Dwellings
Alto: AfB, AlA	Poor where fine sandy loam is 4 to 8 inches thick. Fair where fine sandy loam is 8 to 12 inches thick.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderately slow permeability.	Moderate: fair resistance to piping and erosion.	Moderate: moderate shrink-swell potential; wetness.
Arenosa: ArD	Poor: fine sand.	Good	Slight	Severe: very rapid permeability.	Severe: poor resistance to piping and erosion.	Slight
*Axtell: AtB, AtC2, AtE, AwA. For Wrightsville part of AwA, see Wrightsville series.	Poor where fine sandy loam is 3 to 8 inches thick. Fair where fine sandy loam is 8 to 15 inches thick.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability.	Severe: high shrink-swell potential.
Bernaldo: BeA	Good	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Slight
Bowie: BoB, BoD	Fair where fine sandy loam is 6 to 18 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Slight	Slight
Bub. Mapped only with Trawick soils.	Poor: 10 to 35 percent coarse fragments 3 to 6 inches thick.	Poor: poor traffic-supporting capacity.	Severe: bedrock at a depth of 12 to 20 inches; 15 to 20 percent slopes.	Severe: bedrock at a depth of 12 to 20 inches.	Severe: 12 to 20 inches of borrow material.	Severe: bedrock at a depth of 12 to 20 inches; 15 to 20 percent slopes.
Burleson: Bu	Poor: clay	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability.	Severe: high shrink-swell potential.
Chipley: ChC	Poor: fine sand.	Fair: wetness	Moderate: wetness.	Severe: rapid permeability.	Moderate: poor resistance to piping and erosion.	Moderate: seasonal high water table at a depth of 2 to 5 feet.
*Darco: DaD, DkF. For Kirvin and Tenaha parts of DkF, see Kirvin (KlF) and Tenaha series.	Poor: fine sand.	Good	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.

interpretations

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow care-
soils in the first column of this table]

Degree of limitations and soil features affecting—Continued			Soil features affecting—			
Septic tank filter fields	Sewage lagoons	Sanitary landfill	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Severe: moderately slow permeability; water table at a depth of 3 to 4 feet.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 3 percent.	Severe: clay	Water table at a depth of 3 to 4 feet.	Moderately slow intake rate.	All features favorable.	All features favorable.
Severe: very rapid permeability; possible pollution of water supply.	Severe: very rapid permeability.	Severe: sand; very rapid permeability.	Well drained	Very rapid intake rate; low available water capacity.	Sandy; erodibility.	Erodibility; low available water capacity.
Severe: very slow permeability.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 8 percent. Severe where slopes are 8 to 12 percent.	Severe: clay	Very slow permeability; low wet areas; nearly level moundy areas.	Very slow intake rate.	All features favorable.	Erodibility.
Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Well drained	Moderate available water capacity.	All features favorable.	All features favorable.
Moderate: moderately slow permeability.	Moderate: 1 to 8 percent slopes; moderately slow permeability.	Slight	Well drained to moderately well drained.	Moderate to moderately slow intake rate.	All features favorable.	All features favorable.
Severe: bedrock at a depth of 12 to 20 inches; 15 to 20 percent slopes; moderately slow permeability.	Severe: bedrock at a depth of 12 to 20 inches; 8 to 20 percent slopes.	Severe: shallowness.	Well drained	Shallow soils; slope; low available water capacity.	Shallow soils; slope.	Shallow soils; coarse fragments; low available water capacity.
Severe: very slow permeability.	Slight	Severe: clay	Very slow permeability.	Very slow intake rate.	Dense clayey soils.	Dense clayey soils.
Moderate: seasonal high water table at a depth of 2 to 5 feet.	Severe: rapid permeability.	Severe: fine sand.	Seasonal high water table at a depth of 2 to 5 feet.	Rapid intake rate; low available water capacity.	Sandy; erodibility.	Low available water capacity; erodibility.
Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.	Severe: slopes more than 8 percent; moderately rapid permeability.	Severe: fine sand.	Well drained and somewhat excessively drained.	Moderately rapid intake rate; low available water capacity.	Sandy; erodibility.	Low available water capacity.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road fill	Roads and streets	Farm ponds		Dwellings
				Reservoir area	Embankments	
Dougherty: DoC	Poor: loamy fine sand.	Good	Slight	Moderate: moderate permeability.	Moderate: fair slope stability; poor resistance to piping and erosion.	Slight
Elrose: ElB, ElD, ElE	Fair where fine sandy loam is 8 to 16 inches thick. Good where fine sandy loam is 16 to 20 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.
Eustis: EuD	Poor: fine sand.	Good	Slight	Severe: moderately rapid to rapid permeability.	Severe: poor resistance to piping and erosion.	Slight
Ferris: FcD2	Poor: clay	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair stability.	Severe: high shrink-swell potential.
*Freestone: FrA, FrC, Fs For Lufkin part of Fs, see Lufkin series.	Fair where fine sandy loam is 7 to 16 inches thick. Good where fine sandy loam is 16 to 20 inches thick.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair resistance to piping and erosion.	Severe: high shrink-swell potential; wetness.
Fuquay: FuB, FuD	Poor: loamy fine sand.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: rapid permeability of upper material; slow permeability of lower material.	Moderate: fair resistance to piping and erosion.	Slight
Galey: GoB	Fair where fine sandy loam is 7 to 17 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Slight
Garner: Gc	Poor: clay; wetness.	Poor: poor traffic-supporting capacity; high shrink-swell potential; wetness.	Severe: poor traffic-supporting capacity; high shrink-swell potential; wetness.	Slight	Moderate: fair slope stability; high compressibility.	Severe: high shrink-swell potential; wetness.
Hannahatchee: Ha	Fair where fine sandy loam is 6 to 15 inches thick.	Fair: fair traffic-supporting capacity.	Severe: flooding hazard.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Severe: flooding hazard.
Heiden: HeD	Poor: clay	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability; high compressibility.	Severe: high shrink-swell potential.

interpretations—Continued

Degree of limitations and soil features affecting—Continued			Soil features affecting—			
Septic tank filter fields	Sewage lagoons	Sanitary landfill	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Slight	Severe: moderate permeability.	Moderate: loamy fine sand.	Well drained	Low available water capacity.	Sandy; erodibility.	Low available water capacity.
Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.	Moderate where slopes are 1 to 8 percent. Severe where slopes are 8 to 12 percent.	Slight	Well drained	Slope; erodibility.	Slope	Erodibility.
Slight	Severe: moderately rapid to rapid permeability.	Severe: moderately rapid to rapid permeability.	Somewhat excessively drained.	Moderately rapid to rapid intake rate; low available water capacity.	Sandy; erodibility.	Low available water capacity; erodibility.
Severe: very slow permeability.	Moderate: 5 to 8 percent slopes.	Severe: clay	Well drained	Very slow intake rate; erodibility.	Dense clayey soils.	Dense clayey soils; erodibility.
Severe: slow permeability.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 5 percent.	Moderate: clay loam; moderately well drained to somewhat poorly drained.	Seasonal high water table.	Slow intake rate of lower part of soil.	All features favorable.	All features favorable.
Slight	Severe: rapid permeability of upper material.	Moderate: loamy fine sand.	Well drained	Low available water capacity.	Sandy; erodibility.	Low available water capacity.
Slight	Moderate: moderate permeability.	Slight	Well drained	All features favorable.	All features favorable.	All features favorable.
Severe: very slow permeability; seasonal water table.	Slight	Severe: clay	Very slow permeability.	Very slow intake rate.	Dense clayey soils.	Dense clayey soils; wetness.
vere: flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard.	Flooding hazard; high water table.	Flooding hazard	Flooding hazard	Flooding hazard.
ere: very low permeability.	Moderate: 3 to 8 percent slopes.	Severe: clay	Well drained	Very slow intake rate; erodibility.	Dense clayey soils.	Dense clayey soils; erodibility.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
				Farm ponds		
	Topsoil	Road fill	Roads and streets	Reservoir area	Embankments	Dwellings
Kaufman: Ka, Kc	Poor: clay	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability; high compressibility.	Severe: flooding hazard; high shrink-swell potential.
Kenney: KeC	Poor: loamy fine sand.	Good	Slight	Severe: moderately rapid permeability.	Moderate: poor resistance to piping and erosion.	Slight
*Kirvin: KfD, KmD, KnE. For Sacul part of KnE, see Sacul series.	Poor where fine sandy loam is 3 to 8 inches thick. Fair where fine sandy loam is 8 to 18 inches thick.	Poor: poor traffic-supporting capacity.	Severe: poor traffic-supporting capacity.	Moderate: moderately slow permeability.	Moderate: fair slope stability; medium to high compressibility.	Moderate where slopes are 8 to 12 percent: moderate shrink-swell potential.
KlF, KrF	Poor: 25 to 35 percent coarse fragments.	Poor: poor traffic-supporting capacity.	Severe: 15 to 20 percent slopes; poor traffic-supporting capacity.	Moderate: moderately slow permeability.	Moderate: fair slope stability.	Moderate where slopes are 8 to 15 percent: moderate shrink-swell potential. Severe where slopes are 15 to 20 percent.
Konawa: KsC, KtD2	Fair where fine sandy loam is 7 to 16 inches thick. Good where fine sandy loam is 16 to 20 inches thick.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Moderate: fair slope stability; poor resistance to piping and erosion.	Slight
Kullit: KuB	Fair where fine sandy loam is 6 to 16 inches thick. Good where fine sandy loam is 16 to 20 inches thick.	Fair: fair traffic-supporting capacity; wetness.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Slight	Moderate: fair slope stability.	Moderate: moderate shrink-swell potential; wetness.
Larue: LoB, LoD	Poor: loamy fine sand.	Good	Slight	Moderate: moderate permeability.	Moderate: fair slope stability; fair resistance to piping and erosion.	Slight
Leefield: LeC	Poor: loamy fine sand.	Fair: wetness	Moderate: wetness.	Moderate: moderately slow permeability; seepage.	Moderate: fair resistance to piping and erosion.	Moderate: wetness.

interpretations—Continued

Degree of limitations and soil features affecting—Continued			Soil features affecting—			
Septic tank filter fields	Sewage lagoons	Sanitary landfill	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Severe: very slow permeability; flooding hazard.	Severe: flooding hazard.	Severe: clay; flooding hazard.	Flooding hazard; very slow permeability.	Very slow intake rate; subject to flooding.	Flooding hazard; dense clayey soils.	Flooding hazard; dense clayey soils; wetness.
Slight	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Well drained	Moderately rapid intake rate; low available water capacity.	Sandy; erodibility.	Low available water capacity.
Severe: moderately slow permeability.	Moderate where slopes are 2 to 8 percent. Severe where slopes are 8 to 12 percent.	Moderate: clay loam.	Well drained	Moderately slow intake rate; erodibility.	Slope	Moderate available water capacity; erodibility.
Severe: 15 to 20 percent slopes; moderately slow permeability.	Moderate where slopes are 5 to 8 percent. Severe where slopes are 8 to 20 percent.	Moderate: clay loam; 15 to 20 percent slopes.	Well drained	Moderately slow intake rate; erodibility.	Coarse fragments; slope.	Moderate available water capacity; erodibility.
Slight	Severe: moderate permeability.	Slight	Well drained	Erodibility	All features favorable.	Erodibility.
Severe: slow permeability.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 3 percent.	Moderate: clay loam; moderately well drained.	Seasonal high water table.	All features favorable.	All features favorable.	All features favorable.
Slight	Moderate: 2 to 8 percent slopes; moderate permeability.	Slight	Well drained	Low available water capacity; erodibility.	Sandy; erodibility.	Low available water capacity; erodibility.
Severe: seasonal high water table at a depth of 2 to 5 feet.	Moderate: moderately slow permeability; seepage.	Moderate: loamy fine sand; somewhat poorly drained.	Seasonal high water table.	Low available water capacity.	Sandy; erodibility.	Low available water capacity.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road fill	Roads and streets	Farm ponds		Dwellings
				Reservoir area	Embankments	
Lufkin: LuA	Fair where fine sandy loam is 6 to 14 inches thick; wetness.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential; wetness.	None to slight	Moderate: fair slope stability.	Severe: high shrink-swell potential; wetness.
*Nahatche: Na For Wehadkee part of Na, see Wehadkee series.	Fair: clay loam; wetness.	Fair: fair traffic-supporting capacity; wetness.	Severe: flooding hazard.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Severe: flooding hazard.
Nimrod: NdB	Poor: loamy fine sand.	Fair: fair traffic-supporting capacity; wetness.	Moderate: fair traffic-supporting capacity; wetness.	Moderate: moderately slow permeability.	Moderate: fair slope stability.	Moderate: wetness.
Normangee: NoB, NoD	Fair: clay loam.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability; medium to high compressibility.	Severe: high shrink-swell potential.
Pelham: PeC	Poor: loamy fine sand; wetness.	Poor: wetness	Severe: wetness.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Severe: wetness.
Robinsonville: Ro	Good	Good	Severe: flooding hazard.	Severe: moderately rapid permeability.	Moderate: fair resistance to piping and erosion.	Severe: flooding hazard.
Sacul: SaC	Poor where fine sandy loam is 5 to 9 inches thick.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: medium compressibility.	Severe: high shrink-swell potential.
Stidham: SmC	Poor: loamy fine sand.	Good	Moderate: fair traffic-supporting capacity.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Slight
Susquehanna: SsC, SuD2	Poor where fine sandy loam is 5 to 9 inches thick.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: high compressibility.	Severe: high shrink-swell potential.
Tenaha Mapped only with Darco and Kirvin soils.	Poor: loamy fine sand.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity. Severe where slopes are 15 to 20 percent.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.

interpretations—Continued

Degree of limitations and soil features affecting—Continued			Soil features affecting—			
Septic tank filter fields	Sewage lagoons	Sanitary landfill	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Severe: seasonal high water table at a depth of 1 to 4 feet; very slow permeability.	Slight	Severe: clay	Very slow permeability; high water table; areas of surface ponding.	Very slow intake rate.	Dense clayey subsoil.	Dense clayey subsoil; wetness.
Severe: seasonal high water table at a depth of 1 to 4 feet; flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard.	Flooding hazard; high water table.	Flooding hazard	Flooding hazard	Flooding hazard; wetness.
Severe: moderately slow permeability.	Severe: moderately rapid permeability of surface soil.	Moderate: moderately well drained.	Seasonal high water table.	Low available water capacity.	Sandy; erodibility.	Low available water capacity.
Severe: very slow permeability.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 8 percent.	Severe: clay	Well drained to moderately well drained.	Very slow intake rate; erodibility.	Dense clayey subsoil.	Dense clayey subsoil; erodibility.
Severe: seasonal high water table at a depth of 1 to 4 feet.	Severe: moderate permeability.	Severe: poorly drained.	High water table.	Low available water capacity.	Sandy	Low available water capacity; wetness.
Severe: flooding hazard.	Severe: moderately rapid permeability; flooding hazard.	Severe: flooding hazard.	Flooding hazard	Flooding hazard; moderately rapid intake rate.	Flooding hazard	Flooding hazard.
Severe: slow permeability.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 8 percent.	Severe: clay	Moderately well drained.	Slow intake rate; erodibility.	Clayey subsoil	Clayey subsoil.
Slight	Severe: moderate permeability; seepage.	Slight	Well drained	Low available water capacity.	Sandy; erodibility.	Low available water capacity.
Severe: very slow permeability.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 8 percent. Severe where slopes are 8 to 10 percent.	Severe: clay	Very slow permeability	Very slow intake rate; erodibility.	Dense clayey subsoil.	Dense clayey subsoil; erodibility.
Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.	Severe: 8 to 20 percent slopes.	Slight where slopes are 2 to 15 percent. Moderate where slopes are 15 to 20 percent.	Well drained	Low available water capacity; erodibility.	Sandy; erodibility.	Low available water capacity; erodibility.

TABLE 7.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degrees of limitations and soil features affecting—			
	Topsoil	Road fill	Roads and streets	Farm ponds: Reservoir area	Farm ponds: Embankments	Dwellings
Thenas: Th	Fair: wetness.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential; wetness.	Severe: flooding hazard.	Moderate: moderate permeability.	Moderate: fair resistance to piping and erosion.	Severe: flooding hazard.
*Trawick: TkD, TkF, TmF. For Bub part of TmF, see Bub series.	Poor where fine sandy loam is 5 to 8 inches thick; 15 to 50 percent coarse fragments. Fair where fine sandy loam is 8 to 20 inches thick; 3 to 15 percent coarse fragments.	Poor: poor traffic-supporting capacity.	Moderate where slopes are 2 to 15 percent; fair traffic-supporting capacity. Severe where slopes are 15 to 20 percent.	Moderate: moderately slow permeability of substratum.	Moderate: medium to high compressibility.	Moderate: moderate shrink-swell potential.
Trep: TpC	Poor: loamy fine sand.	Fair: fair traffic-supporting capacity.	Slight	Moderate: moderately slow permeability.	Moderate: fair resistance to piping and erosion.	Slight
Trinity: Tr	Poor: clay	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; flooding hazard; high shrink-swell potential.	Slight	Moderate: fair stability; high compressibility.	Severe: flooding hazard; high shrink-swell potential; wetness.
Wehadkee. Mapped only with Nahatche soils.	Poor: wetness.	Poor: wetness.	Severe: wetness.	Moderate: moderate permeability.	Moderate: medium compressibility.	Severe: flooding hazard; wetness.
Wilson: WlB	Fair: clay loam; wetness.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Slight	Moderate: fair slope stability; medium to high compressibility.	Severe: high shrink-swell potential.
Wrightsville: Wr	Poor: wetness.	Poor: poor traffic-supporting capacity; high shrink-swell potential; wetness.	Severe: poor traffic-supporting capacity; high shrink-swell potential; wetness.	Slight	Moderate: fair slope stability; medium to high compressibility.	Severe: high shrink-swell potential; wetness.

of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. The estimated values for bearing strength and traffic-supporting capacity expressed in words should not be assigned specific values. Estimates are generally made to a depth of about 6 feet, and interpretations do not apply to greater depths. Small areas of other soils and contrasting situations included in the mapping units may have different engineering properties than those listed. Even in these situations, however, the soil map is useful in planning more detailed field investigations and for indicating the kinds of problems that may be expected.

Some terms used in this survey have special meanings

interpretations—Continued

Degree of limitations and soil features affecting—Continued			Soil features affecting—			
Septic tank filter fields	Sewage lagoons	Sanitary landfill	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Severe: flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard.	High water table; subject to flooding.	Flooding hazard	Flooding hazard	Flooding hazard.
Severe where slopes are 15 to 20 percent: moderately slow permeability.	Moderate where slopes are 2 to 8 percent; moderate depth to pervious substratum. Severe where slopes are 8 to 20 percent.	Severe: clay	Well drained	Moderately slow intake rate; erodibility.	Clayey subsoil; slope.	Clayey subsoil; erodibility.
Severe: moderately slow permeability.	Moderate: moderately slow permeability; seepage from surface layer.	Slight	Moderately slow permeability.	Low available water capacity.	Sandy; erodibility.	Low available water capacity.
Severe: very slow permeability; flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard.	Flooding hazard; very slow permeability.	Flooding hazard; very slow intake rate.	Flooding hazard; dense clayey soils.	Flooding hazard; dense clayey soils.
Severe: high water table at a depth of 0 to 1 foot; flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard; poorly drained.	Flooding hazard; high water table.	Flooding hazard	Flooding hazard	Flooding hazard; wetness.
Severe: very slow permeability.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 3 percent.	Severe: clay	Very slow permeability.	Very slow intake rate.	Dense clayey soils.	Dense clayey soils.
Severe: water table at a depth of 1 to 2 feet; slow permeability.	Slight	Severe: silty clay; poorly drained.	Slow permeability.	Slow intake rate	Wetness	Wetness.

in soil science that may not be familiar to engineers. Among the terms that have special meaning in soil science are sand, silt, clay, and horizon. These and other terms are defined in the Glossary.

Engineering classification systems

The two systems most commonly used in classifying samples of soil horizons for engineering are the AASHO system adopted by the American Association of State Highway Officials (*1*) and the Unified system used by the Soil Conservation Service engineers, United States Department of Defense, and others (*9*).

The AASHO system is used to classify soils according to those properties that affect use in highway construc-

tion. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation), and at the other extreme in group A–7 are clay soils that have low strength when wet. The best soils for subgrade are therefore classified as A–1, the next best A–2, and so on to class A–7, the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. If soil material is near a classification boundary, it is given a symbol showing both classes; for example, A–2 or A–4. Within each group, the relative engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest.

In the Unified system, soils are classified according to particle-size distribution, plasticity index, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example SM–SC. The letters used in class designation mean: G, gravel; S, sand; M, silt; and C, clay. Clean sands are identified by SW or SP; sands with fines of silt and clay, by SM or SC; silt and clay that have a low liquid limit, by ML and CL; and silt and clay that have a high liquid limit, by MH and CH.

Table 6 gives the estimated classification for all soils mapped in the survey area.

Estimated soil properties

Table 6 provides estimates of soil properties important in engineering. The estimates are based on field classification and descriptions, physical and chemical tests of selected representative samples, test data from comparable soils in adjacent areas, and detailed experience in working with the individual kind of soil in the survey area.

In the column headed "Hydrologic group," the soils are placed in one of four groups on the basis of intake of water at the end of long-duration storms that occur after prior wetting and opportunity for swelling and without the protective effects of vegetation. The groups range from open sand, which has the lowest runoff potential (Group A), to heavy clay, which has the highest runoff potential (Group D). They are defined in the paragraphs that follow.

Group A consists of soils that have a high infiltration rate even when thoroughly wetted. These are chiefly deep, well-drained to excessively drained sand, gravel or both. These soils have a high rate of water transmission and a low runoff potential.

Group B consists of soils that have a moderate infiltration rate when thoroughly wetted. These are chiefly moderately deep to deep, moderately well drained to well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission and a moderate runoff potential.

Group C consists of soils that have a slow infiltration rate when throughly wetted, chiefly soils that have a layer that impedes the downward movement of water or soils that have a moderately fine texture to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission and a high runoff potential.

Group D soils have a very slow infiltration rate when thoroughly wetted and consist chiefly of (1) clay soils that have a high swelling potential; (2) soils that have a high permanent water table; (3) soils that have a claypan or a clay layer at or near the surface; and (4) shallow soils that are over nearly impervious materials. These soils have a very slow rate of water transmission and a very high runoff potential.

The water table is the highest point of the soil or underlying rock material that is wholly saturated with water for extended periods.

In the column headed "Depth from Surface," the depth, in inches, is given for the major distinctive layers of the soil profile.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and other terms used in the USDA textural classification are defined in the Glossary.

The estimated percentage passing sieve is given for a range in soil material passing sieves of four sizes. This information is useful in helping to determine suitability of the soil as a material for construction purposes.

Permeability, as used in table 6, relates only to movement of water downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are not considered. This rating should not be confused with co-efficient "K" used by engineers.

Available water capacity is the amount of water a soil can hold and make available to plants. It is the numerical difference between the percentage of water at field capacity and the percentage of water at the time plants wilt. The rate is expressed as inches of water per inch of soil depth.

Reaction is the degree of acidity or alkalinity of a soil expressed as a pH value. The pH value and relative terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to the maintenance of structures constructed in, on, or with such materials.

Corrosivity, as used in table 6, indicates the potential danger to uncoated metal or concrete structures through chemical action that dissolves or weakens the structural material. Structural materials may corrode when buried in soil, and a given material corrodes in some kinds of soil more rapidly than it does in others. Extensive

installations that intersect soil boundaries or soil horizons are more likely to be damaged by corrosion than are installations entirely in one kind of soil or soil horizon. Ratings are based on soil conditions at a depth of 4 feet.

Salinity is not a problem in Anderson County.

Bedrock in this county is many feet below the surface of most soils. Glauconite is at a depth of 12 to 20 inches below the Bub soils and 30 to 60 inches below the Trawick soils. Shale is at a depth of 30 to 60 inches below the Normangee soils and 40 to 72 inches below the Sacul soils.

Engineering interpretations

Table 7 contains selected information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, buildings, and sewage disposal systems. Detrimental or undesirable features are emphasized, but very important desirable features also may be listed. The ratings and other interpretations in this table are based on estimated engineering properties of the soils in table 6, on available test data, and on field experience. Although the information applies only to soil depth indicated in table 6, it is reasonably reliable to a depth of about 6 feet for most soils and to a depth of several more feet for some.

Topsoil is a term used to designate a fertile soil or soil material, ordinarily rich in organic matter, used as a topdressing for lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such uses. Ordinarily, only the surface layer is removed for topsoil, but other layers also may be suitable.

Road fill is material used to build embankments. The ratings indicate performance of soil material moved from borrow areas for this purpose.

Road and street location is influenced by features of the undisturbed soil that affect construction and maintenance of roads and streets. The soil features, favorable as well as unfavorable, are the main ones that affect geographic location of roads and streets and are rated in table 6.

Farm pond reservoir areas are affected mainly by seepage loss of water, and the soil features considered are those that influence such seepage.

Pond embankments serve as dams. The soil features of both subsoil and substratum are those important to the use of soils for constructing embankments, generally less than 20 feet of height.

Dwellings are affected chiefly by features of the undisturbed soil that influence its capacity to support low buildings that have normal foundation loads. Specific values of bearing strength are not assigned.

Septic tank filter fields are affected mainly by permeability, location of water table, and susceptibility of the soil to flooding. The degree of limitations and main reasons for assigning moderate to severe ratings are given.

Sewage lagoons are influenced chiefly by soil features, such as permeability, location of water table, and slope. The degree of limitations and main reasons for assigning moderate or severe ratings are given.

Sanitary landfill is affected mainly by soil depth, drainage, permeability, slope, and texture. The degree of limitations and main reasons for assigning the ratings are given.

The agricultural drainage factors considered are the soil features and qualities that affect the installation and performance of surface drainage practices.

The irrigation features considered are those that affect suitability of the soils for irrigation.

The features considered for terraces and diversions are those soil features and qualities that affect stability or hinder layout and construction.

The factors considered for grassed waterways are the soil features and qualities that affect the establishment, growth, and maintenance of plants and the factors that hinder layout and construction.

Recreational facilities

Table 8 shows the degree of soil limitation for selected recreational uses.

A rating of *slight* means that the soil has no limitation. The limitation is not serious and is easy to overcome.

A rating of *moderate* means that the limitation must be recognized, but it can be overcome or corrected by means that are generally practical.

A rating of *severe* means that the use of the soil is questionable because the limitation is difficult to overcome.

When the rating is moderate or severe, the factors responsible for the rating are given.

Campsites are areas suitable for tent and camp trailer sites and the accompanying activities for outdoor living. They are used frequently during the camping season. These areas require little site preparation and should be suitable for unsurfaced parking for cars and camp trailers, for heavy foot traffic by humans or horses, and for vehicular traffic. The soils should be free of coarse fragments and rock outcroppings. Suitability of a soil for supporting vegetation is a separate item to be considered in the final evaluation when selecting a site for this use. Factors considered in establishing campsite ratings are wetness, flooding, permeability, slope, texture of surface soil, coarse fragments, and stoniness or rockiness.

Limitations of the soils for picnic areas are based only on soil features and do not include other features such as the presence of trees or lakes that may affect the desirability of a site. Suitability of a soil for supporting vegetation is a separate item to be considered in the final evaluation of a site for this use. Factors considered in establishing ratings for picnic areas are wetness, flooding, slope, texture of surface soil, stoniness, and rockiness.

Intensive play areas are areas to be developed for playgrounds and areas for baseball, football, badminton, and other organized games. These areas are subject to intensive foot traffic, and they generally require a nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface. The most desirable soil is free of rock outcrops and coarse fragments. It is assumed that good vegetative cover can be established and maintained on areas where needed. Factors considered in establishing ratings are wetness, flooding,

TABLE 8.—*Degree of limitation and chief limiting properties of soils for selected recreational use*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series in the first column of this table]

Soil series and map symbols	Campsites	Picnic areas	Intensive play areas	Paths and trails
Alto: AfB, AlA	Moderate: moderately slow permeability.	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 3 percent.	Slight.
Arenosa: ArD	Severe: fine sand	Severe: fine sand	Severe: fine sand	Severe: fine sand.
*Axtell: AtB, AtC2, AtE, AwA. For Wrightsville part of AwA, see Wrightsville series.	Severe: very slow permeability.	Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 12 percent.	Severe: very slow permeability.	Slight.
Bernaldo: BeA	Slight	Slight	Slight	Slight.
Bowie: BoB, BoD	Slight	Slight	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 8 percent.	Slight.
Bub. Mapped only with Trawick soils.	Moderate where slopes are 5 to 15 percent. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 5 to 15 percent. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 5 to 6 percent. Severe where slopes are 6 to 20 percent.	Moderate: clay loam; 15 to 20 percent slopes.
Burleson: Bu	Severe: clay; very slow permeability.	Severe: clay	Severe: clay; very slow permeability.	Severe: clay.
Chipley: ChC	Severe: fine sand	Severe: fine sand	Severe: fine sand	Severe: fine sand.
*Darco: DaD, DkF. For Kirvin and Tenaha parts of DkF, see Kirvin (KlF) and Tenaha series.	Moderate where slopes are as much as 15 percent: fine sand. Severe where slopes are 15 to 20 percent.	Moderate where slopes are as much as 15 percent: fine sand. Severe where slopes are 15 to 20 percent.	Severe: fine sand	Moderate: fine sand.
Dougherty: DoC	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand.
Elrose: ElB, ElD, ElE	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 12 percent.	Slight where slopes are 1 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent.	Slight.
Eustis: EuD	Severe: fine sand	Severe: fine sand	Severe: fine sand; 6 to 8 percent slopes.	Severe: fine sand.
Ferris: FcD2	Severe: clay	Severe: clay	Severe: clay	Severe: clay.
*Freestone: FrA, FrC, Fs. For Lufkin part of Fs, see Lufkin series.	Moderate: wetness; slow permeability.	Moderate: wetness	Moderate: 2 to 5 percent slopes; wetness; slow permeability.	Moderate: wetness.
Fuquay: FuB, FuD	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand.
Galey: GaB	Slight	Slight	Slight where slopes are 0 to 2 percent. Moderate where slopes 2 to 3 percent.	Slight.
Garner: Gc	Severe: clay; wetness	Severe: clay; wetness	Severe: clay; wetness.	Severe: clay; wetness.
Hannahatchee: Ha	Severe: flooding hazard.	Moderate: flooding hazard.	Severe: flooding hazard.	Slight.

TABLE 8.—*Degree of limitation and chief limiting properties of soils for selected recreational use*—Continued

Soil series and map symbols	Campsites	Picnic areas	Intensive play areas	Paths and trails
Heiden: HeD	Severe: clay; very slow permeability.	Severe: clay	Severe: clay; 6 to 8 percent slopes; very slow permeability.	Severe: clay.
Kaufman: Ka, Kc	Severe: clay; very slow permeability.	Severe: clay	Severe: clay; very slow permeability; flooding hazard.	Severe: clay.
Kenney: KeC	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand; 2 to 5 percent slopes.	Moderate: loamy fine sand.
*Kirvin: KfD, KmD, KnE For Sacul part of KnE, see Sacul series.	Moderate: moderately slow permeability; 8 to 12 percent slopes.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 12 percent.	Moderate where slopes are 2 to 6 percent: coarse fragments; moderately slow permeability. Severe where slopes are 6 to 12 percent.	Slight.
KlF, KrF	Moderate where slopes are 8 to 15 percent: 25 to 35 percent coarse fragments; moderately slow permeability. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 8 to 15 percent: 25 to 35 percent coarse fragments. Severe where slopes are 15 to 20 percent.	Severe: 7 to 20 percent slopes; 25 to 35 percent coarse fragments.	Moderate: 15 to 20 percent slopes; 25 to 35 percent coarse fragments.
Konawa: KsC, KtD2	Slight	Slight	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 8 percent.	Slight.
Kullit: KuB	Moderate: wetness	Slight	Moderate: 2 to 3 percent slopes; wetness.	Slight.
Larue: LaB, LaD	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate where slopes are 2 to 6 percent: loamy fine sand. Severe where slopes are 6 to 8 percent.	Moderate: loamy fine sand.
Leefield: LeC	Moderate: loamy fine sand; wetness.	Moderate: loamy fine sand; wetness.	Moderate: loamy fine sand; 2 to 5 percent slopes; wetness.	Moderate: loamy fine sand.
Lufkin: LuA	Severe: wetness; very slow permeability.	Moderate: wetness	Severe: wetness; very slow permeability.	Moderate: wetness.
*Nahatche: Na For Wehadkee part of Na, see Wehadkee series.	Severe: flooding hazard; wetness.	Moderate: flooding hazard.	Severe: flooding hazard.	Moderate: flooding hazard; wetness.
Nimrod: NdB	Severe: loamy fine sand.	Severe: loamy fine sand.	Severe: loamy fine sand.	Severe: loamy fine sand.
Normangee: NoB, NoD	Severe: very slow permeability.	Moderate: clay loam	Severe: very slow permeability.	Moderate: clay loam.
Pelham: PeC	Severe: wetness	Severe: wetness	Severe: wetness.	Severe: wetness.
Robinsonville: Ro	Severe: flooding hazard.	Moderate: flooding hazard.	Severe: flooding hazard.	Moderate: flooding hazard.
Sacul: SaC	Moderate: slow permeability.	Slight	Moderate where slopes are 2 to 6 percent: slow permeability. Severe where slopes are 6 to 8 percent.	Slight.
Stidham: SmC	Moderate: loamy fine sand.	Moderate: loamy fine sand.	Moderate: loamy fine sand; 2 to 5 percent slopes.	Moderate: loamy fine sand.
Susquehanna: SsC, SuD2	Severe: very slow permeability.	Moderate: 8 to 10 percent slopes; wetness.	Severe: 6 to 10 percent slopes; very slow permeability.	Moderate: wetness.

TABLE 8.—*Degree of limitation and chief limiting properties of soils for selected recreational use*—Continued

Soil series and map symbols	Campsites	Picnic areas	Intensive play areas	Paths and trails
Tenaha Mapped only with Darco and Kirvin soils.	Severe: loamy fine sand; 15 to 20 percent slopes.	Severe: loamy fine sand; 15 to 20 percent slopes.	Severe: loamy fine sand; 8 to 20 percent slopes.	Severe: loamy fine sand.
Thenas: Th	Severe: flooding hazard.	Severe: flooding hazard.	Severe: flooding hazard.	Moderate: flooding hazard.
*Trawick: TkD, TkF, TmF For Bub part of TmF, see Bub series.	Moderate where slopes are 8 to 15 percent: moderately slow permeability. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 8 to 15 percent: 2 to 20 percent coarse fragments. Severe where slopes are 15 to 20 percent: 20 to 50 percent coarse fragments.	Moderate where slopes are 2 to 6 percent: moderately slow permeability. Severe where slopes are 6 to 20 percent.	Moderate: 15 to 20 percent slopes.
Trep: TpC	Moderate: loamy fine sand; moderately slow permeability.	Moderate: loamy fine sand.	Moderate: loamy fine sand; 2 to 5 percent slopes; moderately slow permeability.	Moderate: loamy fine sand.
Trinity: Tr	Severe: clay; flooding hazard; very slow permeability.	Severe: clay	Severe: clay; flooding hazard; very slow permeability.	Severe: clay.
Wehadkee Mapped only with Nahatche soils.	Severe: flooding hazard; wetness.	Severe: flooding hazard; wetness.	Severe: flooding hazard; wetness.	Severe: flooding hazard; wetness.
Wilson: WlB	Severe: wetness; very slow permeability.	Moderate: clay loam; wetness.	Severe: wetness; very slow permeability.	Moderate: clay loam; wetness.
Wrightsville: Wr	Severe: wetness; slow permeability.	Severe: wetness	Severe: wetness; slow permeability.	Severe: wetness.

permeability, slope, texture of surface soil, depth to hard bedrock, stoniness, and coarse fragments.

Paths and trails are used for cross-country hiking, bridle paths, and other nonintensive uses that allow for random movement of people. It is assumed that these areas are to be used as they occur in nature and that little soil is moved (excavated) for the planned recreational use. Ratings are based only on soil features and do not include other items that may be important in the selection of a site for this use. Soils that have severe limitations may be best from the natural beauty or use standpoint, but they require more preparation or maintenance for such use. Factors considered in establishing ratings are wetness, flooding, slope, texture of surface soil, and stoniness or rockiness of surface.

Engineering, general

The general soil map in this survey shows large areas of soils that have similar characteristics. These various soil patterns generally reflect the suitability of sites for engineering use. General information helps farmers, ranchers, and agricultural technicians in understanding problems involved in selecting sites for various engineering structures or practices.

1. Fuquay-Kirvin-Darco association. The soils in this area are generally not suited to earthen structures. Rapid seepage can be expected from reservoir areas. These soils have moderate to severe limitations for nonfarm uses.

2. Darco association. The soils in this area are generally not suited to earthen structures. Rapid seepage can be expected from reservoir areas. These soils have moderate to severe limitations for nonfarm uses.

3. Trawick-Elrose-Bub association. This area has substratum material that is poorly suited to earthen dams. The steep slopes of this association are not suitable for cultivation. These soils have moderate to severe limitations for most nonfarm uses.

4. Axtell-Lufkin-Stidham association. The soils in this area are generally suited to earthen structures, such as farm ponds, terraces, waterways, and diversions. In some places seepage can be expected through the substratum material. Some areas in this association need drainage to remove water from ponded areas. These soils have moderate to severe limitations for nonfarm uses.

5. Kaufman-Trinity association. The soils in this area are generally well suited to farm ponds. Protection from flooding is necessary before these soils can be used for cultivated crops. These soils have severe limitations for nonfarm uses.

6. Nahatche-Wehadkee association. The soils in this area are located in the flood plain of the Neches River. These soils are suited to excavated type ponds and are generally not selected for engineering practices. They have severe limitations for most nonfarm uses.

Formation and Classification of the Soils

The major factors of soil formation and how they have affected the soils of Anderson County are discussed in this section. The main processes of horizon

differentiation also are explained. The current system for classifying soils is defined, and the soils of the county are classified according to this system.

Factors of Soil Formation

Climate, living organisms (especially vegetation), parent material, relief, and time (*2*, *6*) are the five major factors of soil formation. The kind of soil that forms in one area differs from the kind of soil that forms in another area if one or more of the major factors are different in the two areas.

Climate

The climate of Anderson County is warm and humid. It is uniform throughout the county, but its effects have been modified locally by relief and runoff. Rainfall is high and has affected soil formation. Many of the soils are wet or saturated much of the time, and the soluble minerals have been leached. Leaching has removed free lime from the upper layers of many of the soils.

Living organisms

Plants, micro-organisms, earthworms, and other forms of animal life are important in the formation of soils. The kinds and amounts of plants are determined partly by climate and parent material. The vegetation in this county is mostly trees, but in some areas prairie grasses are the dominant plants. Pine and hardwood make up the chief vegetation in the southern one-half and the eastern two-thirds of the county. The rest of the county is mostly hardwood forest. Fuquay, Kirvin, and Darco soils, which are acid, support pine and hardwood; Axtell and Stidham soils, which are less acid, support oak forest; and Heiden soils, which are calcareous, support grass.

The forest-type vegetation contributes large amounts of organic acid that accelerates the leaching of minerals from the soil. Plant and animal remains help to build up the organic matter of the soil. Burrowing animals such as earthworms help to mix the soil layers and distribute the organic materials in the soil.

Man also has influenced soil formation by clearing the forest and cropping the soils. He has kept the fields clean tilled, thus increasing the runoff and allowing the soils to wash. He has fenced the pastures and overgrazed the grasses, destroying or decreasing many native plants. Because of these abuses, the organic matter of the soil has been depleted, and much rich topsoil has washed away. Tillage implements have compacted the soil, thus slowing water intake.

Parent material

The soils of Anderson County formed in four different kinds of parent materials (*3*). Most of the sandy and loamy soils of the county formed in acid, sandy, loamy, and clayey sediment of the Queen City sand beds of the Mount Selman Formation. Several soils formed in loamy and clayey material rich in glauconite. Soils on an old river terrace near the flood plain of the Trinity River formed in alkaline, clayey, and loamy alluvial sediment. Soils in the flood plain of the Trinity River formed in recent alkaline, clayey sediment washed from the Blackland Prairies.

Fuquay and Kirvin soils are among those that formed in the marine sediment of the Queen City sand beds. Trawick and Alto soils formed in the iron-rich marine sediment. Axtell and Stidham soils are among those that formed in the alluvium of old river terraces. Trinity and Kaufman soils are the only ones formed in the Trinity River flood plain.

Relief

Relief influences soil formation through its effects on drainage and runoff. If other factors are equal, the degree of profile formation depends on the amount of water that enters and passes through a soil. If runoff is rapid, as on steep slopes, little water enters the soil and passes through it, and the soil does not develop a deep profile with well-defined horizons. For example, the steeper Kirvin soils have not developed as thick a profile as have the more gently sloping Bowie soils. The rate of soil formation may be exceeded by the erosion on steep slopes.

Exposure also affects the kind and amount of vegetation on a soil, but it is of little importance in Anderson County. Because soils on north-facing slopes receive less sunlight than those on south-facing slopes, they lose less moisture through evaporation. As a result, north-facing slopes are usually more thickly vegetated, are moist more of the time, have a thicker forest mat of leaves and plant remains, and therefore, are more strongly developed.

Time

The characteristics of a soil are determined mainly by the length of time that the soil-forming factors have been active. A long time generally is required for the formation of well-defined, genetically related horizons. Bowie and Susquehanna soils are examples of soils that have been in place a long time and have approached equilibrium with their environment. They are mature, or old, soils and show marked horizon differentiation. Thenas and Trinity soils on bottom lands are examples of young soils that have a weakly developed profile.

Processes of Horizon Differentiation

The processes involved in the formation of soil horizons in Anderson County are (1) accumulation of organic matter, (2) leaching of calcium carbonates and bases, and (3) formation and translocation of silicate clay minerals. More than one of these processes have been active in most soils.

The accumulation of organic matter in the upper part of the profile has been important in the formation of an A1 horizon. The soils of Anderson County are generally low in organic-matter content because the matter decomposes rapidly.

Nearly all the soils of this county have been leached of carbonates. This leaching has contributed to the formation of horizons. For example, Kirvin soils have been leached of most carbonates and show distinct horizons. In contrast, Trinity soils have not been leached and do not show distinct horizons.

The translocation of clay minerals has also contributed to horizon formation in Anderson County. The

eluviated A horizon of many soils is lower in clay content than is the B horizon, but the B horizon normally has an accumulation of clay in pores and on ped surfaces. In the soils of this county, leaching of carbonates and soluble salts and the translocation of silicate clays are among the more important processes in horizon differentiation. Fuquay soils are examples of those in which silicate clays have accumulated in the B horizon.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationship to one another and to the whole environment, and understand their behavior and their response to manipulation. First through classification, and then through use of the soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The current system of classification was adopted by the National Cooperative Soil Survey in 1965.[5] The system has six categories. Beginning with the most inclusive, the categories are the order, the suborder, the great group, the subgroup, the family, and the series. The placement of some soil series in the current system, particularly in families, may change as more precise information becomes available. Readers interested in the development of the system should refer to the latest literature available (*4, 5, 8*). Table 9 shows the classification of the soils in this county according to the family, the subgroup, and the order.

General Nature of the County

The area that is now Anderson County was once inhabited by tribes of the Cherokee, Blackfoot, Kickapoo, and Caddo Indians. Spaniards established and

[5] See the unpublished working document "Selected chapters from the unedited text of the soil taxonomy" available in the SCS State Office, Temple, Texas.

TABLE 9.—*Soil series classified according to the current system of classification*[1]

Series	Family	Subgroup	Order
Alto	Fine, kaolinitic, thermic	Typic Paleudalfs	Alfisols.
Arenosa	Thermic, coated	Typic Quartzipsamments	Entisols.
Axtell	Fine, montmorillonitic, thermic	Udertic Paleustalfs	Alfisols.
Bernaldo	Fine-loamy, siliceous, thermic	Typic Paleudalfs	Alfisols.
Bowie	Fine-loamy, siliceous, thermic	Plinthic Paleudults	Ultisols.
Bub	Clayey, mixed, thermic, shallow	Typic Hapludalfs	Alfisols.
Burleson	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Chipley	Thermic, coated	Aquic Quartzipsamments	Entisols.
Darco	Loamy, siliceous, thermic	Grossarenic Paleudults	Ultisols.
Dougherty	Loamy, mixed, thermic	Arenic Haplustalfs	Alfisols.
Elrose	Fine-loamy, siliceous, thermic	Typic Paleudalfs	Alfisols.
Eustis	Sandy, siliceous, thermic	Psammentic Paleudults	Ultisols.
Ferris	Fine, montmorillonitic, thermic	Udorthentic Chromusterts	Vertisols.
Freestone	Fine-loamy, siliceous, thermic	Aquic Paleudalfs	Alfisols.
Fuquay	Loamy, siliceous, thermic	Arenic Plinthic Paleudults	Ultisols.
Galey	Fine-loamy, mixed, thermic	Ultic Paleustalfs	Alfisols.
Garner	Fine, montmorillonitic, thermic	Entic Pelluderts	Vertisols.
Hannahatchee	Fine-loamy, mixed, thermic	Dystric Fluventic Eutrochrepts	Inceptisols.
Heiden	Fine, montmorillonitic, thermic	Udic Chromusterts	Vertisols.
Kaufman	Fine, montmorillonitic, thermic	Vertic Haplaquolls	Mollisols.
Kenney	Loamy, mixed, thermic (siliceous)	Grossarenic Paleudalfs	Alfisols.
Kirvin	Clayey, mixed, thermic	Typic Hapludults	Ultisols.
Konawa	Fine-loamy, mixed, thermic	Ultic Haplustalfs	Alfisols.
Kullit	Fine-loamy, siliceous, thermic	Aquic Paleudults	Ultisols.
Larue	Loamy, siliceous, thermic	Arenic Paleudalfs	Alfisols.
Leefield	Loamy, siliceous, thermic	Arenic Plinthaquic Paleudults	Ultisols.
Lufkin	Fine, montmorillonitic, thermic	Vertic Albaqualfs	Alfisols.
Nahatche	Fine-loamy, mixed, nonacid, thermic	Aeric Fluvaquents	Entisols.
Nimrod	Loamy, siliceous, thermic	Aquic Arenic Paleustalfs	Alfisols.
Normangee	Fine, montmorillonitic, thermic	Vertic Haplustalfs	Alfisols.
Pelham	Loamy, siliceous, thermic	Arenic Paleaquults	Ultisols.
Robinsonville	Coarse-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Sacul	Clayey, mixed, thermic	Aquic Hapludults	Ultisols.
Stidham	Loamy, mixed, thermic	Arenic Haplustalfs	Alfisols.
Susquehanna	Fine, montmorillonitic, thermic	Vertic Paleudalfs	Alfisols.
Tenaha	Loamy, siliceous, thermic	Arenic Hapludults	Ultisols.
Thenas	Coarse-loamy, mixed, thermic	Aquic Fluventic Eutrochrepts	Inceptisols.
Trawick	Fine, kaolinitic, thermic	Mollic Hapludalfs	Alfisols.
Trep	Loamy, siliceous, thermic	Arenic Paleudults	Ultisols.
Trinity	Fine, montmorillonitic (calcareous), thermic	Vertic Haplaquolls	Mollisols.
Wehadkee	Fine-loamy, mixed, nonacid, thermic	Typic Fluvaquents	Entisols.
Wilson	Fine, montmorillonitic, thermic	Vertic Ochraqualfs	Alfisols.
Wrightsville	Fine, mixed, thermic	Typic Glossaqualfs	Alfisols.

[1] Classification current October, 1970.

abandoned a mission on the Trinity River sometime before Anglo-Americans established settlements in the 1830's. Mound Prairie, Fort Houston, and Pilgrim were the first of these settlements.

Anderson County was named for Kenneth Lewis Anderson, the last vice-president of the Republic of Texas. The county was created from Houston County in 1846 and was organized that same year.

The first railroad to Palestine was completed in 1872. The first iron foundry was built in 1874 and smeltered iron from iron-rich material of the Redland Hills. The first oil gusher was drilled in 1928.

The population of the county was 36,318 in 1936 and 27,789 in 1970. The population of Palestine was 15,455 in 1936 and 14,525 in 1970.

Climate [6]

The city of Palestine, the most populous community in Anderson County, is in the humid, subtropical belt that extends northward from the Gulf of Mexico. Its climate is dominated by this belt in spring, summer, and fall. Frequently in winter, cold polar air from the north interacts with the moist tropical air from the Gulf over this region. As a result, rainfall at Palestine is plentiful and is fairly evenly distributed throughout the year. Average annual rainfall is 40.34 inches. The least rainfall is received during July and August. The driest year on record (since 1882) at Palestine was 1909 with 23.98 inches; the wettest year was 1957 with 62.48 inches. Heavy, short-period rains may fall almost anytime during the year. These are usually associated with large, slow-moving thunderstorms or with dying tropical storms that sometimes enter the Texas coast and move northward through East Texas in the fall. A climatological summary is shown in table 10 .

Summer is warm and humid. The average daily maximum temperature is 93.3° and 94.3°F in July and August, respectively. In winter and early in spring, the cold polar airmasses pushing down from the north produce sudden temperature changes. When these cold airmasses stagnate and are overrun by moist air from the south, several days of cold, cloudy, rainy weather follow. Ordinarily, these occasional cold spells last only a few days. A strong outbreak of unusually cold air in January 1930 caused the temperature to drop to −4° at Palestine. The record low of −6° was established in February 1899. Winters are mild despite these occasional temperature drops. An average of only 43 days per season have temperatures of 32° or below.

Snowfalls are rare and insignificant as a source of moisture. Several winters in succession may pass with no measurable snow.

Relative humidity is high but not so high as in the coastal regions. Mean annual relative humidity is 80 to 85 percent at 6:00 a.m. and 55 to 60 percent both at noon and at 6:00 p.m. Central Standard Time.

The county has an average growing season (freeze-free period) of 264 days. The average date of the first freeze in the fall is November 27th, and the average date of the last spring freeze is March 8th. Palestine receives about 60 to 65 percent of the total possible sunshine annually. The cloudiest months are December, January, and February. The prevailing wind is from the south.

In summary, the climate of Palestine is subtropical with mild winters and warm humid summers. Rainfall is plentiful, producing lush growth.

[6] By ROBERT B. ORTON, State climatologist, Environmental Science Services Administration, National Weather Service, U.S. Department of Commerce.

Farming

Livestock and lumber production are the main farm enterprises in Anderson County. Crop production was once the major enterprise, but the land that was formerly cultivated is now mostly in pasture, about one-quarter million acres. All of the following acreage estimates are from the 1970 Conservation Needs Inventory.

About 30,000 acres in the county is used for such truck crops as cowpeas, melons, sweet potatoes, and tomatoes. A smaller acreage is in corn, grain sorghum, and sudangrass. About 22,000 acres is in hay crops, and about 21,000 acres is in conservation crops and idle cropland.

Beef cattle are the main livestock. Most of the cattle are sold at local auctions for commercial and domestic use. Herds are mostly cow-calf operations and are maintained year around. Most sales are made directly from herds; few animals are brought to maturity in feed-lots. Many purebred herds produce breeding stock for local and State-wide sales. Much of the beef is produced on improved pasture of Coastal bermudagrass and lovegrass, but native pasture also furnishes much grazing.

About 337,000 acres is wooded and is mostly in mixed stands of pine and hardwood, but pure stands of hardwood are in some areas. Much of the timberland is in large holdings operated by the lumber industry. Some formerly cultivated land has been planted to pine. About 127,000 acres of the 337,000 acres of forest is grazed.

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TABLE 10.—*Temperature and*

[All data from Palestine, elevation 580 feet; period of record 1931–1965.

Month	Temperature [1]				Precipitation			
	Average daily maximum	Average monthly maximum	Average daily minimum	Average monthly minimum	Average total [1]	Probability, in percent, of receiving selected amount during month		
						0 or trace	0.50 inch or more	1 inch or more
	°F	°F	°F	°F	*Inches*	*Pct*	*Pct*	*Pct*
January	57.3	75.9	38.3	18.8	3.58	<1	98	93
February	61.4	78.2	41.3	24.3	3.22	<1	98	93
March	68.0	83.3	46.9	29.7	3.47	<1	98	93
April	76.1	87.4	55.9	40.3	3.67	<1	99	95
May	82.8	90.8	63.5	51.9	4.87	<1	>99	95
June	89.8	95.7	70.3	62.2	3.23	5	90	82
July	93.3	99.7	72.8	67.7	2.43	<1	94	83
August	94.3	101.0	72.2	65.3	2.39	2	85	72
September	88.4	97.4	66.8	53.9	2.97	<1	90	78
October	80.3	90.3	57.6	42.1	2.74	2	86	87
November	67.5	82.7	46.6	30.5	3.78	<1	94	83
December	59.7	76.7	40.5	23.1	3.99	<1	97	93
Year	76.6	88.3	56.1	48.1	40.34			

[1] Average length of record, 35 years.
[2] Average length of record, 10 years.
[3] Trace, an amount too small to measure.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance. for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low

precipitation data

The symbol < means less than, and the symbol > means more than]

Precipitation—Continued									
Probability, in percent, of receiving selected amount during month—Continued					Average number of days when precipitation measures [2]			Snow and sleet [1]	
2 inches or more	3 inches or more	4 inches or more	5 inches or more	6 inches or more	0.10 inch or more	0.50 inch or more	1 inch or more	Average total	Maximum monthly
Pct	*Pct*	*Pct*	*Pct*	*Pct*				*Inches*	*Inches*
70	50	35	23	14	5	2	1	0.7	5.2
73	50	34	22	12	7	3	2	.2	3.0
70	49	30	20	5	5	2	1	.3	3.5
83	67	50	34	23	6	3	2	(3)	(3)
84	70	58	40	30	4	3	2	0	0
61	43	32	19	17	6	3	2	0	0
58	40	23	18	10	3	1	1	0	0
45	32	20	12	10	4	2	1	0	0
58	38	27	18	10	5	2	1	0	0
54	40	25	20	11	3	2	1	0	0
70	50	40	30	20	6	3	1	.1	4.8
80	65	55	35	25	7	2	1	.3	3.3
					61	28	16	1.6	5.2

in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gilgai. Typically, the microrelief of Vertisols—clayey soils that have a high coefficient of expansion and contraction with changes in moisture: usually a succession of microbasins and microknolls, in nearly level areas, or of microvalleys and microridges that run with the slope.

Glauconite. A granular silicate of potassium and iron, which gives the greenish color to greensand.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by grass for protection against erosion; used to conduct surface water away from cropland.

Gravel. As a soil separate, the rounded or angular fragments of rock that range in size from 2 millimeters to 3 inches in diameter. As a soil textural class, soil material that consists of 15 to 50 percent gravel, by volume. In engineering, gravel is a coarse-grained soil of which more than 50 percent is retained on a No. 4 screen.

Greensand. A sand or sediment given a dark-greenish color by grains of glauconite.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Marl. An earthy, crumbly deposit consisting chiefly of calcium carbonate mixed with clay or other impurities in varying degrees.

Microrelief. Minor surface configurations, such as low mounds and shallow pits.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parallelepipeds. Wedge-shaped structural aggregates having a long axis tilted 10 to 60 degrees from the horizontal.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. See Reaction, soil.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents that commonly shows as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to hardpan or to irregular aggregates upon repeated wetting and drying, or it is the hardened relicts of the soft, red mottles. It is a form of laterite.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shale. A sedimentary rock formed by the consolidation of clay or silt having a fine stratified or laminated structure and composed of minerals essentially the same since deposited.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site index. A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on relatively steep slopes and in swelling clays, where there is marked change in moisture content.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of or arranged in, strata or layers, as stratified alluvium.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to flooding. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifiying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, woodland group, or any other group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Predicted yields, tables 2 and 3, pages 48 and 50.
Engineering, tables 6 and 7, pages 66 to 81.
Recreation, table 8, page 84.

Map symbol	Mapping unit	Page	Capability unit		Pasture and hay group		Woodland group		Woodland grazing group	
			Symbol	Page	Symbol	Page	Symbol	Page	Name	Page
AfB	Alto fine sandy loam, 1 to 3 percent slopes	7	IIe-2	45	8C	51	3o7	57	Redland	62
AlA	Alto loam, 0 to 1 percent slopes	7	I-1	44	8C	51	3o7	57	Redland	62
ArD	Arenosa fine sand, 1 to 8 percent slopes	7	IVs-1	47	9B	52	5s3	58	Deep Sand	61
AtB	Axtell fine sandy loam, 0 to 3 percent slopes	8	IIIe-1	45	8A	51	5c0	58	Tight Sandy Loam	62
AtC2	Axtell fine sandy loam, 2 to 5 percent slopes, eroded	9	IVe-1	46	8A	51	5c0	58	Tight Sandy Loam	62
AtE	Axtell fine sandy loam, 5 to 12 percent slopes	9	VIe-1	47	8B	51	5c0	58	Tight Sandy Loam	62
AwA	Axtell-Wrightsville complex, 0 to 1 percent slopes	9	IVw-1	47	8E	52	5c0	58	Tight Sandy Loam	62
BeA	Bernaldo fine sandy loam, 0 to 1 percent slopes	10	I-2	44	8C	51	2o7	56	Sandy Loam	62
BoB	Bowie fine sandy loam, 1 to 3 percent slopes	10	IIe-1	44	8C	51	3o1	57	Sandy Loam	62
BoD	Bowie fine sandy loam, 3 to 8 percent slopes	10	IIIe-4	45	8C	51	3o1	57	Sandy Loam	62
Bu	Burleson clay	11	IIw-3	45	7A	49	5c0	58	Blackland	60
ChC	Chipley fine sand, 0 to 5 percent slopes	12	IIIw-1	45	9C	52	3w2	57	Sandy	62
DaD	Darco fine sand, 1 to 8 percent slopes	12	IIIs-1	46	9B	52	4s3	57	Sandy	62
DkF	Darco, Kirvin, and Tenaha soils, sloping	12	VIe-2	47	9B	52	4s3	57	Sandy	62
DoC	Dougherty loamy fine sand, 1 to 5 percent slopes	15	IIIe-2	45	9A	52	5s0	58	Sandy	62
ElB	Elrose fine sandy loam, 1 to 3 percent slopes	15	IIe-1	44	8C	51	3o1	57	Redland	62
ElD	Elrose fine sandy loam, 3 to 8 percent slopes	15	IIIe-4	45	8C	51	3o1	57	Redland	62
ElE	Elrose fine sandy loam, 8 to 12 percent slopes	16	VIe-1	47	8D	51	3o1	57	Redland	62
EuD	Eustis fine sand, 2 to 8 percent slopes	16	IIIs-1	46	9B	52	3s3	57	Sandy	62
FcD2	Ferris clay, 5 to 8 percent slopes	17	VIe-1	47	7A	49	5c0	58	Blackland	60
FrA	Freestone fine sandy loam, 0 to 1 percent slopes	18	IIw-1	45	8C	51	5o0	59	Sandy Loam	62
FrC	Freestone fine sandy loam, 1 to 5 percent slopes	18	IIIe-1	45	8C	51	5o0	59	Sandy Loam	62
Fs	Freestone-Lufkin complex	18	IIIw-2	45	8E	52	5o0	59	Sandy Loam	62
FuB	Fuquay loamy fine sand, 0 to 3 percent slopes	19	IIIs-2	46	9A	52	3s2	57	Sandy	62
FuD	Fuquay loamy fine sand, 3 to 8 percent slopes	19	IIIe-2	45	9A	52	3s2	57	Sandy	62
GaB	Galey fine sandy loam, 0 to 3 percent slopes	20	IIe-1	44	8C	51	5o0	59	Sandy Loam	62
Gc	Garner clay	21	IIIw-3	46	7A	49	5c0	58	Blackland	60

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Pasture and hay group		Woodland group		Woodland grazing group	
			Symbol	Page	Symbol	Page	Symbol	Page	Name	Page
Ha	Hannahatchee fine sandy loam-----	22	Vw-1	47	2A	49	1o7	56	Loamy Bottomland	62
HeD	Heiden clay, 3 to 8 percent slopes----------	23	IVe-3	47	7A	49	5c0	58	Blackland	60
Ka	Kaufman clay----------	24	IIw-2	45	1A	49	1w6	56	Clayey Bottomland	61
Kc	Kaufman clay, frequently flooded-	24	Vw-2	47	1A	49	1w6	56	Clayey Bottomland	61
KeC	Kenney loamy fine sand, 1 to 5 percent slopes----------	25	IIIs-1	46	9B	52	3s2	57	Sandy	62
KfD	Kirvin fine sandy loam, 3 to 8 percent slopes----------	25	IVe-2	47	8C	51	3o1	57	Sandy Loam	62
KlF	Kirvin complex, 5 to 20 percent slopes----------	25	VIe-1	47	8D	51	4d2	57	Sandy Loam	62
KmD	Kirvin complex, graded, 2 to 8 percent slopes----------	26	VIe-1	47	8C	51	4c2	57	Sandy Loam	62
KnE	Kirvin-Sacul association, sloping----------	26	VIe-1	47	8D	51	4c2	57	Sandy Loam	62
KrF	Kirvin stony soils, 5 to 20 percent slopes----------	27	VIs-1	48	8D	51	4d2	57	Sandy Loam	62
KsC	Konawa fine sandy loam, 2 to 5 percent slopes----------	27	IIIe-4	45	8C	51	5o0	59	Sandy Loam	62
KtD2	Konawa soils, 5 to 8 percent slopes, eroded----------	27	IIIe-4	45	8C	51	5o0	59	Sandy Loam	62
KuB	Kullit fine sandy loam, 1 to 3 percent slopes----------	28	IIe-1	44	8C	51	3w8	57	Sandy Loam	62
LaB	Larue loamy fine sand, 1 to 3 percent slopes----------	29	IIIs-2	46	9A	52	3s2	57	Sandy	62
LaD	Larue loamy fine sand, 3 to 8 percent slopes----------	29	IIIe-2	45	9A	52	3s2	57	Sandy	62
LeC	Leefield loamy fine sand, 1 to 5 percent slopes----------	30	IIIw-1	45	9C	52	3w2	57	Sandy	62
LuA	Lufkin fine sandy loam, 0 to 1 percent slopes----------	30	IIIw-2	45	8E	52	5w0	58	Tight Sandy Loam	62
Na	Nahatche and Wehadkee soils------	31	VIw-1	48	2A	49	1w6	56	Loamy Bottomland	62
NdB	Nimrod loamy fine sand, 0 to 3 percent slopes----------	32	IIIs-2	46	9A	52	5s0	58	Sandy	62
NoB	Normangee clay loam, 1 to 3 percent slopes----------	32	IIIe-3	45	7H	49	5c0	58	Tight Sandy Loam	62
NoD	Normangee clay loam, 3 to 8 percent slopes----------	33	VIe-3	48	7I	51	5c0	58	Tight Sandy Loam	62
PeC	Pelham loamy fine sand, 0 to 5 percent slopes----------	33	VIw-2	48	9C	52	2w3	56	Flatwoods	61
Ro	Robinsonville fine sandy loam----	34	Vw-1	47	2A	49	1o7	56	Loamy Bottomland	62
SaC	Sacul fine sandy loam, 1 to 5 percent slopes----------	35	IVe-1	46	8A	51	3c2	57	Tight Sandy Loam	62
SmC	Stidham loamy fine sand, 1 to 5 percent slopes----------	36	IIIe-2	45	9A	52	5s0	58	Sandy	62
SsC	Susquehanna fine sandy loam, 1 to 5 percent slopes----------	37	IVe-1	46	8A	51	3c2	57	Tight Sandy Loam	62
SuD2	Susquehanna soils, 3 to 10 percent slopes, eroded---------	37	VIe-1	47	8A	51	3c2	57	Tight Sandy Loam	62
Th	Thenas fine sandy loam----------	38	Vw-1	47	2A	49	1w8	56	Loamy Bottomland	62
TkD	Trawick fine sandy loam, 2 to 8 percent slopes----------	39	IVe-4	47	8C	51	3o1	57	Redland	62
TkF	Trawick fine sandy loam, 8 to 20 percent slopes----------	39	VIe-1	47	8D	51	3o1	57	Redland	62
TmF	Trawick and Bub soils, moderately steep----------	40	VIe-1	47	8D	51	4r3	57	Redland	62
TpC	Trep loamy fine sand, 1 to 5 percent slopes----------	40	IIIe-2	45	9A	52	3s2	57	Sandy	62
Tr	Trinity clay----------	41	Vw-2	47	1A	49	1w6	56	Clayey Bottomland	61
WlB	Wilson clay loam, 0 to 3 percent slopes----------	42	IIIe-3	45	7H	49	5c0	58	Blackland	60
Wr	Wrightsville clay loam----------	43	IVw-1	47	8E	52	5w0	58	Flatwoods	61

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

ANDERSON COUNTY, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

N

SOIL ASSOCIATIONS *

1. Fuquay-Kirvin-Darco association: Deep, sandy and loamy, nearly level to moderately steep soils on uplands
2. Darco association: Deep, sandy, gently sloping to moderately steep soils on uplands
3. Trawick-Elrose-Bub association: Deep to shallow, loamy, gently sloping to moderately steep soils on uplands
4. Axtell-Lufkin-Stidham association: Deep, loamy to sandy, nearly level to strongly sloping soils on uplands
5. Kaufman-Trinity association: Deep, clayey, nearly level soils on bottom lands
6. Nahatche-Wehadkee association: Deep, loamy, nearly level soils on bottom lands

* The texture is that of the surface layer of the major soils.

Compiled 1974

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

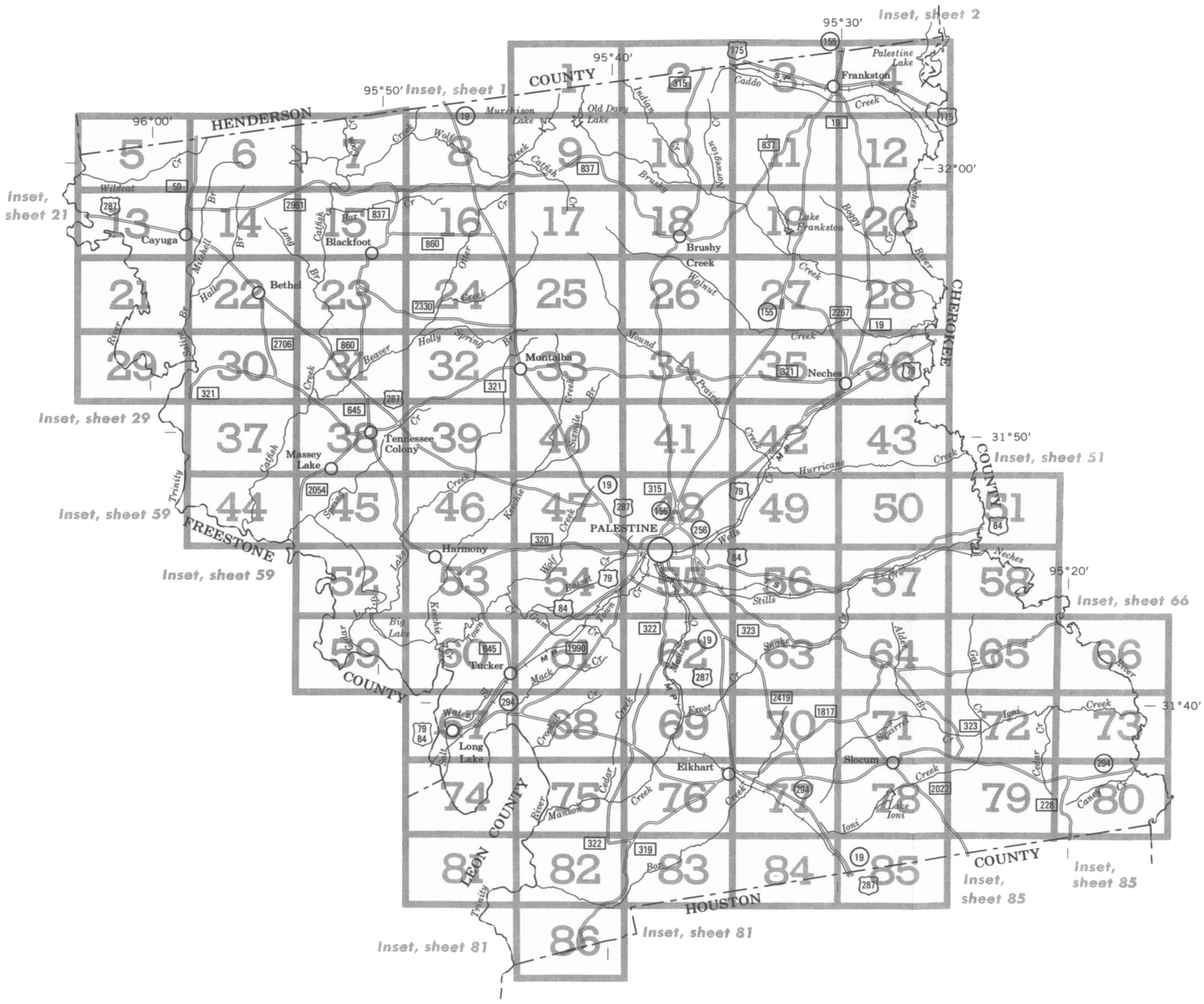
INDEX TO MAP SHEETS

ANDERSON COUNTY, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

N



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Symbols without a slope letter are those of nearly level soils. A final number, 2, in a symbol shows that the soil is eroded.

SYMBOL	NAME
AfB	Alto fine sandy loam, 1 to 3 percent slopes
AlA	Alto loam, 0 to 1 percent slopes
ArD	Arenosa fine sand, 1 to 8 percent slopes
AtB	Axtell fine sandy loam, 0 to 3 percent slopes
AtC2	Axtell fine sandy loam, 2 to 5 percent slopes, eroded
AtE	Axtell fine sandy loam, 5 to 12 percent slopes
AwA	Axtell-Wrightsville complex, 0 to 1 percent slopes
BeA	Bernaldo fine sandy loam, 0 to 1 percent slopes
BoB	Bowie fine sandy loam, 1 to 3 percent slopes
BoD	Bowie fine sandy loam, 3 to 8 percent slopes
Bu	Burleson clay
ChC	Chipley fine sand, 0 to 5 percent slopes
DaD	Darco fine sand, 1 to 8 percent slopes
DkF	Darco, Kirvin, and Tenaha soils, sloping *
DoC	Dougherty loamy fine sand, 1 to 5 percent slopes
ElB	Elrose fine sandy loam, 1 to 3 percent slopes
ElD	Elrose fine sandy loam, 3 to 8 percent slopes
ElE	Elrose fine sandy loam, 8 to 12 percent slopes
EuD	Eustis fine sand, 2 to 8 percent slopes
FcD2	Ferris clay, 5 to 8 percent slopes, eroded
FrA	Freestone fine sandy loam, 0 to 1 percent slopes
FrC	Freestone fine sandy loam, 1 to 5 percent slopes
Fs	Freestone-Lufkin complex
FuB	Fuquay loamy fine sand, 0 to 3 percent slopes
FuD	Fuquay loamy fine sand, 3 to 8 percent slopes
GaB	Galey fine sandy loam, 0 to 3 percent slopes
Gc	Garner clay
Ha	Hannahatchee fine sandy loam
HeD	Heiden clay, 3 to 8 percent slopes
Ka	Kaufman clay
Kc	Kaufman clay, frequently flooded
KeC	Kenney loamy fine sand, 1 to 5 percent slopes
KfD	Kirvin fine sandy loam, 3 to 8 percent slopes
KlF	Kirvin complex, 5 to 20 percent slopes
KmD	Kirvin complex, graded, 2 to 8 percent slopes
KnE	Kirvin-Sacul association, sloping *
KrF	Kirvin stony soils, 5 to 20 percent slopes
KsC	Konawa fine sandy loam, 2 to 5 percent slopes
KtD2	Konawa soils, 5 to 8 percent slopes, eroded
KuB	Kullit fine sandy loam, 1 to 3 percent slopes
LaB	Larue loamy fine sand, 1 to 3 percent slopes
LaD	Larue loamy fine sand, 3 to 8 percent slopes
LeC	Leefield loamy fine sand, 1 to 5 percent slopes
LuA	Lufkin fine sandy loam, 0 to 1 percent slopes
Na	Nahatche and Wehadkee soils *
NdB	Nimrod loamy fine sand, 0 to 3 percent slopes
NoB	Normangee clay loam, 1 to 3 percent slopes
NoD	Normangee clay loam, 3 to 8 percent slopes
PeC	Pelham loamy fine sand, 0 to 5 percent slopes
Ro	Robinsonville fine sandy loam
SaC	Sacul fine sandy loam, 1 to 5 percent slopes
SmC	Stidham loamy fine sand, 1 to 5 percent slopes
SsC	Susquehanna fine sandy loam, 1 to 5 percent slopes
SuD2	Susquehanna soils, 3 to 10 percent slopes, eroded
Th	Thenas fine sandy loam
TkD	Trawick fine sandy loam, 2 to 8 percent slopes
TkF	Trawick fine sandy loam, 8 to 20 percent slopes
TmF	Trawick and Bub soils, moderately steep *
TpC	Trep loamy fine sand, 1 to 5 percent slopes
Tr	Trinity clay
WlB	Wilson clay loam, 0 to 3 percent slopes
Wr	Wrightsville clay loam

* The delineations are much larger and the composition of these units is more variable than other map units in the county. Mapping has been controlled well enough, however, for the anticipated use of the soils.

ANDERSON COUNTY, TEXAS

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State, farm or ranch

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Buildings

- School
- Church

Mine and quarry — QU.

Gravel pit — G.P.

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds

- Perennial — water, w
- Intermittent — int

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments

- Bedrock
- Other

Short steep slope

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stoniness
- Stony
- Very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gully

Borrow pit — B.P.

Oil wasteland — O.W.

ANDERSON COUNTY, TEXAS

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State, farm or ranch

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings

- School
- Church

Mine and quarry (QU.)

Gravel pit (G.P.)

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds

- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments

- Bedrock
- Other

Short steep slope

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Borrow pit (B.P.)
- Oil wasteland (O.W.)

ANDERSON COUNTY, TEXAS — SHEET NUMBER 1

ANDERSON COUNTY, TEXAS NO. 1

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 400 000 FEET

893 000 FEET

HENDERSON COUNTY

(Joins 7)

(Joins lower left)

(Joins sheet 8)

3 420 000 FEET

890 000 FEET

3 000 AND 5 000-FOOT GRID TICKS

3 425 000 FEET

895 000 FEET

(Joins inset)

(Joins sheet 2)

(Joins sheet 9)

3 445 000 FEET

N

1 Mile

5 000 Feet

Scale 1:20 000

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

3 520 000 FEET

911 000 FEET

913 000 FEET

3 500 000 FEET

2000 AND 5000-FOOT GRID TICKS

HENDERSON COUNTY

PALESTINE LAKE

CHEROKEE CO

(Joins sheet 4)

3 470 000 FEET

895 000 FEET

900 000 FEET

(Joins sheet 1)

(Joins sheet 3)

3 450 000 FEET

(Joins sheet 10)

Caddo Marsh

FOSTER CEMETERY

water

315

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 2

ANDERSON COUNTY, TEXAS — SHEET NUMBER 3

ANDERSON COUNTY, TEXAS NO. 3

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1971 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 475 000 FEET

905 000 FEET

HENDERSON COUNTY

LIBERTY HILL CEMETERY

SOUTHERN PACIFIC

Caddo Marsh

Caddo Creek

FRANKSTOWN

Myrtle Spring Church

Caney Branch

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 11)

3 495 000 FEET

895 000 FEET

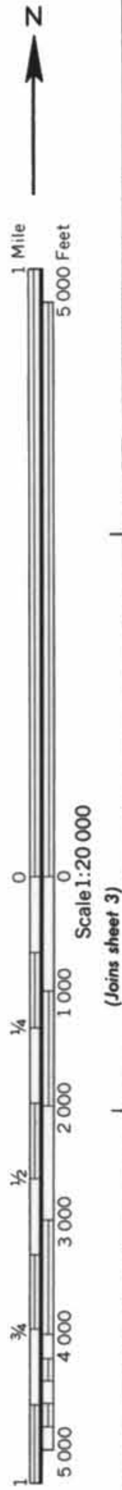
3

N

1 Mile

5 000 Feet

Scale 1:20 000



Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 4

ANDERSON COUNTY, TEXAS — SHEET NUMBER 5

ANDERSON COUNTY, TEXAS NO. 5

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 330 000 FEET

885 000 FEET

HENDERSON COUNTY

FREESTONE COUNTY

TRINITY RIVER

Wildcat Creek

(Joins inset, sheet 21)

(Joins sheet 6)

(Joins sheet 13)

875 000 FEET

3 350 000 FEET

5

N

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 1 000 2 000 3 000 4 000 5 000

¼ 0 ¼ ½ ¾ 1

N

1 Mile 5,000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

3 370 000 FEET

885 000 FEET

875 000 FEET

3 355 000 FEET

HENDERSON COUNTY

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 14)

Mill Creek

Mitchell Branch

water

int

59

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 6

ANDERSON COUNTY, TEXAS — SHEET NUMBER 7

ANDERSON COUNTY, TEXAS NO. 7

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 375 000 FEET

885 000 FEET

HENDERSON COUNTY

(Joins sheet 8)

(Joins sheet 6)

(Joins sheet 15)

3 400 000 FEET

875 000 FEET

7

N

1 Mile 5 000 Feet

Scale 1:20 000

1 000 0 1 000

¼ ½ ¾ 1

2 000 3 000 4 000 5 000

Creek

Catfish

Coon

int

2961

ANDERSON COUNTY, TEXAS — SHEET NUMBER 8

(8)

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

3 420 000 FEET

890 000 FEET

875 000 FEET

3 400 000 FEET

(Joins inset, sheet 1)

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 16)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 8

ANDERSON COUNTY, TEXAS — SHEET NUMBER 9

ANDERSON COUNTY, TEXAS NO. 9

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 425 000 FEET

890 000 FEET

(Joins sheet 1)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 17)

3 445 000 FEET

875 000 FEET

Old Davy Lake

Murchison Lake

Union Church

Brushy Creek

Scarborough Lake

Midway Church

Brushy

Hog Catfish Creek

Scale 1:20 000

1 Mile

5 000 Feet

N

(10)

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 2)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 18)

3 470 000 FEET

890 000 FEET

875 000 FEET

3 450 000 FEET

Indian Creek

Fosterville

Norwegian Creek

Brushy Creek

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station

ANDERSON COUNTY, TEXAS NO. 10

ANDERSON COUNTY, TEXAS — SHEET NUMBER 11

11

N

3 475 000 FEET

890 000 FEET

(Joins sheet 3)

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 19)

880 000 FEET

3 495 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS NO. 11

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(12)

N

(Joins sheet 4)

3 520 000 FEET

890 000 FEET

880 000 FEET

3 500 000 FEET

(Joins sheet 20)

(Joins sheet 11)

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 12

ANDERSON COUNTY, TEXAS — SHEET NUMBER 13

ANDERSON COUNTY, TEXAS NO. 13

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 330 000 FEET

865 000 FEET

(Joins sheet 5)

(Joins inset, sheet 21)

(Joins sheet 21)

3 350 000 FEET

855 000 FEET

(Joins sheet 14)

(Joins sheet 12)

13

N

1 Mile

5 000 Feet

Scale 1:20 000

1/4 1/2 3/4 1

1 000 2 000 3 000 4 000 5 000

(Joins sheet 6)

3 375 000 FEET

870 000 FEET

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 13)

(Joins sheet 15)

855 000 FEET

(Joins sheet 22)

3 355 000 FEET

Cayuga

JUDSON CEMETERY

Mitchell Branch

Mitchell

Hall Branch

Long Branch

Short Branch

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 14

ANDERSON COUNTY, TEXAS — SHEET NUMBER 15

ANDERSON COUNTY, TEXAS NO. 15

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 380 000 FEET

870 000 FEET

(Joins sheet 14)

(Joins sheet 7)

(Joins sheet 16)

(Joins sheet 23)

860 000 FEET

3 400 000 FEET

Catfish Creek

Box Creek

Long Br.

Blackfoot

15

N

1 Mile

5 000 Feet

Scale 1:20 000

16

N

1 Mile

5 000 Feet

0

Scale 1:20 000

1/4 1 000

1/2 3 000

3/4 4 000

1 5 000

(Joins sheet 8)

(Joins sheet 15)

(Joins sheet 24)

(Joins sheet 17)

3 420 000 FEET

870 000 FEET

860 000 FEET

3 405 000 FEET

Springfield

Bradford

Midway

Pickle Chapel

Gray Chapel

Bois D'Arc

LIBERTY CEMETERY

Creek

Otter

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 16

ANDERSON COUNTY, TEXAS — SHEET NUMBER 17

17

N

3 425 000 FEET

870 000 FEET

(Joins sheet 9)

(Joins sheet 16)

(Joins sheet 18)

860 000 FEET

(Joins sheet 25)

3 450 000 FEET

Catfish Creek

Pine Mtn

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾

ANDERSON COUNTY, TEXAS NO. 17

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

1 Mile 5 000 Feet

0 0 Scale 1:20 000

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins sheet 10)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 26)

3 470 000 FEET

875 000 FEET

860 000 FEET

3 450 000 FEET

HOPEWELL CEMETERY

MT ZION CEMETERY

Brushy Creek

Norwegian Creek

Little Brushy Creek

Walnut Creek

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 18

ANDERSON COUNTY, TEXAS NO. 19

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(Joins sheet 12)

(Joins sheet 19)

(Joins sheet 28)

3 520 000 FEET

875 000 FEET

865 000 FEET

3 500 000 FEET

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 20

ANDERSON COUNTY, TEXAS — SHEET NUMBER 21

ANDERSON COUNTY, TEXAS NO. 21

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 324 000 FEET
870 000 FEET
(Joins sheet 13)
(5)
860 000 FEET
2000 AND 5000-FOOT GRID TICKS
3 326 000 FEET
3 335 000 FEET
850 000 FEET
(Joins sheet 13)
840 000 FEET
(Joins sheet 29)
3 350 000 FEET
(Joins sheet 22)

FREESTONE COUNTY
TRINITY RIVER
Saline Branch

Tr, Wr, ArD, NdB, SmC, KeC, AtB, AtC2, FcD2, KtD2, DoC, Fs, AwA, Kc, HeD, Bu, Gc, AtE, Ro, FcD2, Na, DaD, O.W.

21
N
1 Mile
5 000 Feet
Scale 1:20 000

22

ANDERSON COUNTY, TEXAS — SHEET NUMBER 22

N

(Joins sheet 14)

3 375 000 FEET

855 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

(Joins sheet 21)

(Joins sheet 23)

840 000 FEET

(Joins sheet 30)

3 355 000 FEET

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 22

ANDERSON COUNTY, TEXAS — SHEET NUMBER 23

ANDERSON COUNTY, TEXAS NO. 23

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

23

N

Scale 1:20 000

1 Mile
5 000 Feet
1 000
¼
0
0
1 000
¼
2 000
½
3 000
¾
4 000
1
5 000

3 380 000 FEET
855 000 FEET
845 000 FEET
3 400 000 FEET

(Joins sheet 15)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 31)

Long Branch
Short Branch
Catfish Creek
Friendship Church

ANDERSON COUNTY, TEXAS — SHEET NUMBER 24

(24)

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 23)

(Joins sheet 16)

3 425 000 FEET

855 000 FEET

(Joins sheet 25)

840 000 FEET

(Joins sheet 32)

3 405 000 FEET

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 24

ANDERSON COUNTY, TEXAS NO. 25

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 18)

(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 34)

3 470 000 FEET

855 000 FEET

845 000 FEET

3 455 000 FEET

Earle Lake

Elmwood

Elmwood Church

Elmwood School

Oak Grove Church

Walnut Creek

Quarry

315

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 26

ANDERSON COUNTY, TEXAS — SHEET NUMBER 27

ANDERSON COUNTY, TEXAS NO. 27

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 475 000 FEET

860 000 FEET

(Joins sheet 19)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 35)

3 495 000 FEET

845 000 FEET

FuB

27

N

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾ 1

KmD

N

(Joins sheet 20)

3 520 000 FEET

860 000 FEET

845 000 FEET

3 500 000 FEET

(Joins sheet 36)

(Joins sheet 27)

1 Mile — 5 000 Feet

Scale 1:20 000

1 000 — 2 000 — 3 000 — 4 000 — 5 000

Todd Lake

Todd City

OIL WASTELAND

GRAVEL PIT

Storage Tanks

G.P.

Brushy Creek

Walnut Creek

Neches River

CHEROKEE COUNTY

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 28

ANDERSON COUNTY, TEXAS — SHEET NUMBER 29

ANDERSON COUNTY, TEXAS NO. 29

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 347 000 FEET

820 000 FEET

(Joins lower right)

(Joins sheet 37)

810 000 FEET

3 353 000 FEET

(Inset B, sheet 59)

3000 AND 5000-FOOT GRID TICKS

3 340 000 FEET

835 000 FEET

(Joins sheet 21)

(Joins sheet 30)

825 000 FEET

3 350 000 FEET

(Joins inset)

TRINITY RIVER

FREESTONE COUNTY

Saline Br

Duck Lake

Tr

WlB

DoC

KeC

LuA

AtE

AtC2

Gc

Bu

NoB

AtB

KsC

ArD

29

N

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 30

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS — SHEET NUMBER 31

ANDERSON COUNTY, TEXAS NO. 31

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 380 000 FEET

835 000 FEET

(Joins sheet 30)

(Joins sheet 23)

(Joins sheet 32)

(Joins sheet 38)

3 400 000 FEET

825 000 FEET

SHAW CEMETERY

Sand Pond

Sand Lake

Tennessee Colony School

Creek

Beaver Creek

Catfish Creek

31

N

1 Mile 5 000 Feet

Scale 1:20 000

N

Scale 1:20 000

1 Mile 5 000 Feet

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 24)

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 39)

3 425 000 FEET

840 000 FEET

825 000 FEET

3 405 000 FEET

Holly Spring Church

Providence Church

Providence School

PROVIDENCE CEMETERY

Holly Creek

Beaver Creek

Spring Br

321

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 32

ANDERSON COUNTY, TEXAS — SHEET NUMBER 33

ANDERSON COUNTY, TEXAS NO. 33

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 430 000 FEET

840 000 FEET

(Joins sheet 25)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 40)

3 450 000 FEET

830 000 FEET

Montalba

Butler Church

BUTLER CEMETERY

JERUSALEM CEMETERY

Mound Prairie Cr

Ha Creek

33

N

Scale 1:20 000

1 Mile

5 000 Feet

N

1 Mile
5 000 Feet
Scale 1:20 000
0
0
¼
1 000
½
2 000
¾
3 000
1
4 000
5 000

(Joins sheet 26)

3 475 000 FEET

840 000 FEET

830 000 FEET

(Joins sheet 33)

(Joins sheet 35)

(Joins sheet 41)

3 455 000 FEET

Elmtown Community

Mound Prairie Creek

PRICE CEMETERY

New Chapel

Brown Spring Church

Mt Comfort Church

Pinson Marsh

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 34

ANDERSON COUNTY, TEXAS — SHEET NUMBER 35

ANDERSON COUNTY, TEXAS NO. 35

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 475 000 FEET

840 000 FEET

(Joins sheet 34)

(Joins sheet 27)

(Joins sheet 36)

(Joins sheet 42)

830 000 FEET

3 500 000 FEET

35

N

1 Mile

5 000 Feet

Scale 1:20 000

Walnut Creek

Cooper Cr.

PINE RIDGE CEMETERY

NECHES CEMETERY

PACIFIC

MISSOURI

321

155

2267

2574

ANDERSON COUNTY, TEXAS — SHEET NUMBER 36

36

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins sheet 28)

(Joins sheet 35)

(Joins sheet 43)

3 520 000 FEET

845 000 FEET

830 000 FEET

3 505 000 FEET

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 36

ANDERSON COUNTY, TEXAS — SHEET NUMBER 37

ANDERSON COUNTY, TEXAS NO. 37

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 355 000 FEET

820 000 FEET

(Joins inset, sheet 29)

(Joins sheet 30)

(Joins sheet 38)

(Joins sheet 44)

3 375 000 FEET

810 000 FEET

TRINITY RIVER

Allen Lake

Weed Lake

Goose Pond

Catfish Creek

COLEMAN CEMETERY

37

N

1 Mile

5 000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

N

(Joins sheet 31)

3 400 000 FEET

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins sheet 37)

810 000 FEET

Catfish Creek

Tennessee Colony

TENNESSEE COLONY CEMETERY

Union Church

Massey Lake

Spring Creek

820 000 FEET

(Joins sheet 39)

3 380 000 FEET

(Joins sheet 45)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS — SHEET NUMBER 39

ANDERSON COUNTY, TEXAS NO. 39

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 405 000 FEET

820 000 FEET

(Joins sheet 32)

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 46)

3 425 000 FEET

810 000 FEET

39

N

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 40

(40)

N

1 Mile

5 000 Feet

Scale 1:20 000

(Joins sheet 39)

(Joins sheet 33)

(Joins sheet 41)

(Joins sheet 47)

3 450 000 FEET

825 000 FEET

810 000 FEET

3 430 000 FEET

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 40

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

(Joins sheet 35)

(Joins sheet 41)

(Joins sheet 43)

(Joins sheet 49)

3 500 000 FEET

825 000 FEET

815 000 FEET

3 480 000 FEET

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 42

ANDERSON COUNTY, TEXAS — SHEET NUMBER 43

ANDERSON COUNTY, TEXAS NO. 43

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(43)

N

1 Mile

5 000 Feet

Scale 1:20 000

1 0 1 000 2 000 3 000 4 000 5 000

(Joins inset, sheet 51)

(Joins sheet 36)

(Joins sheet 42)

(Joins sheet 50)

3 505 000 FEET

3 525 000 FEET

825 000 FEET

815 000 FEET

White Oak Creek

Neches

CHEROKEE COUNTY

Flint Hill School

St Johns Church

Flag Lake

water

Hurricane Creek

Hurricane Creek

Creek

River

ANDERSON COUNTY, TEXAS — SHEET NUMBER 44

N

1 Mile | 5 000 Feet

Scale 1:20 000

0 | ¼ | ½ | ¾ | 1

0 | 1000 | 2000 | 3000 | 4000 | 5000

(Joins sheet 37)

3 375 000 FEET

805 000 FEET

(Joins inset B, sheet 59)

(Joins sheet 45)

790 000 FEET

3 355 000 FEET

(Inset A, sheet 59)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 44

ANDERSON COUNTY, TEXAS — SHEET NUMBER 45

ANDERSON COUNTY, TEXAS NO. 45

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 380 000 FEET

805 000 FEET

(Joins sheet 38)

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 52)

3 400 000 FEET

795 000 FEET

SITE NO 1

SITE NO 2

SITE NO 3

Prairie Lake

Camel Lake

Snag Lake

Bear Lake

Spring

int

45

N

Scale 1:20 000

1 Mile

5 000 Feet

(Joins sheet 39)

3 425 000 FEET

805 000 FEET

795 000 FEET

3 405 000 FEET

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 53)

N

Scale 1:20 000

1 Mile 5 000 Feet 1 000 2 000 3 000 4 000 5 000

0 0

1/4 1/2 3/4 1

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 46

ANDERSON COUNTY, TEXAS NO. 47

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 430 000 FEET

805 000 FEET

(Joins sheet 40)

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 54)

795 000 FEET

3 450 000 FEET

47

N

1 Mile
5 000 Feet
Scale 1:20 000

Fivemile Branch
Keechi Creek
Chalybeate Creek
Wolf Creek Lake
NCAR BALLOON BASE
PALESTINE AIRPORT
City Lake No. 2
City Lake No. 1

ANDERSON COUNTY, TEXAS — SHEET NUMBER 48

(48)

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

1¼ 5 000

(Joins sheet 41)

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 55)

3 475 000 FEET

810 000 FEET

795 000 FEET

3 455 000 FEET

ANDERSON CEMETERY

Davy Lake

Golf Course

Pacific Creek

Missouri Wells

PALESTINE
(county seat)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 48

ANDERSON COUNTY, TEXAS NO. 49

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000 3 000

¾ 4 000

1 5 000

(Joins sheet 43)

(Joins sheet 49)

(Joins sheet 51)

(Joins sheet 57)

3 525 000 FEET

3 505 000 FEET

810 000 FEET

800 000 FEET

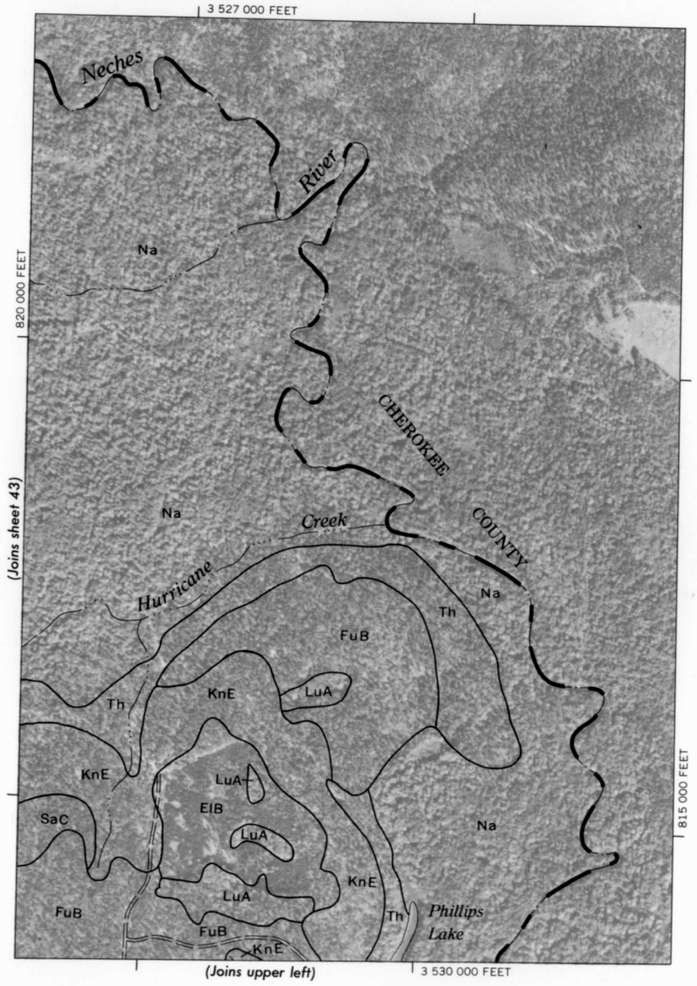
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 50

ANDERSON COUNTY, TEXAS NO. 51

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.



3000 AND 5000-FOOT GRID TICKS

3 550 000 FEET

800 000 FEET

51

N

1 Mile
5 000 Feet
0
0
Scale 1:20 000
¼
1 000
½
2 000
¾
3 000
1
4 000
5 000

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

3 400 000 FEET

790 000 FEET

775 000 FEET

3 380 000 FEET

(Joins inset A, sh 59)

(Joins sheet 45)

(Joins sheet 53)

(Joins sheet 59)

Flag Pond

Brushy Pond

Clear Lake

Cedar Lake

Cedar Lake Slough

Cedar Lake Creek

Big Lake

TRINITY RIVER

TRINITY RIVER

FREESTONE COUNTY

Kc Tr Ka Na Th Gc

FcD2 AtE AtB AtC2 DoC FuD FuB KmD LuA FrC DkF EuD SmC KuB GaB ArD NoD KtD2 Wr KsC NdB KeC WlB NoB AwA

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS — SHEET NUMBER 53

53

3 405 000 FEET

790 000 FEET

(Joins sheet 46)

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 60)

3 425 000 FEET

780 000 FEET

N

Scale 1:20 000

1 Mile

5 000 Feet

Harmony

Keechie Creek

Wolf Creek

Town Creek

Lake Creek

ANDERSON COUNTY, TEXAS NO. 53

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

1 Mile 5 000 Feet

Scale 1:20 000

0 0 1/4 1 000 1/2 2 000 3/4 3 000 1 4 000 5 000

(Joins sheet 47)

3 450 000 FEET

790 000 FEET

780 000 FEET

3 430 000 FEET

(Joins sheet 53)

(Joins sheet 55)

(Joins sheet 61)

Broyles

Four Pines School

Four Pines

PALESTINE
(county seat)

City Lake No. 1

Duggeys Lake

Chalybeate Creek

Wolf Creek

Basset Creek

Gum Town Creek

Missouri Pacific

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 54

ANDERSON COUNTY, TEXAS — SHEET NUMBER 55

ANDERSON COUNTY, TEXAS NO. 55

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 455 000 FEET

790 000 FEET

780 000 FEET

3 475 000 FEET

PALESTINE
(county seat)

Spring Park Lake

Wells Cr.

Creek

Town

Willow Slough

Mtanson Creek

MISSOURI PACIFIC

G.P. MISSOURI PACIFIC

TEXAS

SOUTH-EASTERN

CEMETERY

FORT HOUSTON CEMETERY

PLEASANT SPRINGS CEMETERY

Industrial Site TkD

water

(Joins sheet 54)

(Joins sheet 48)

(Joins sheet 56)

(Joins sheet 62)

N

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 56

56

N

(Joins sheet 49)

3 500 000 FEET

795 000 FEET

Scale 1:20 000

1 Mile

5 000 Feet

(Joins sheet 55)

780 000 FEET

3 480 000 FEET

(Joins sheet 63)

(Joins sheet 57)

Circle Lake No 2

Circle Lake No 1

Crystal Lake

Deanwright

Swanson Hill

Stills Creek

SOUTH EASTERN TEXAS

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 56

ANDERSON COUNTY, TEXAS — SHEET NUMBER 57

57

N

3 505 000 FEET

795 000 FEET

(Joins sheet 50)

(Joins sheet 56)

(Joins sheet 58)

785 000 FEET

(Joins sheet 64)

3 525 000 FEET

Creek

Stills

Kossuth

Fields Chapel

Jarvis

Langston

SOUTH EASTERN TEXAS

Sumac

Snake

1 Mile

5 000 Feet

Scale 1:20 000

0 5 000 1 000 2 000 3 000 4 000

¼ ½ ¾ 1

ANDERSON COUNTY, TEXAS NO. 57

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

ANDERSON COUNTY, TEXAS — SHEET NUMBER 58

58

N

(Joins sheet 51)

3 550 000 FEET

795 000 FEET

(Joins sheet 57)

785 000 FEET

3 530 000 FEET

(Joins sheet 65)

(Joins inset, sheet 66)

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000 5 000

Na Th FuB KnE KfD FuD KeC EfD LaB TmF SaC DkF DaD ChC Ro KrF KuB

TEXAS SOUTH EASTERN

Neches River

Creek

Hassels

CHEROKEE COUNTY

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

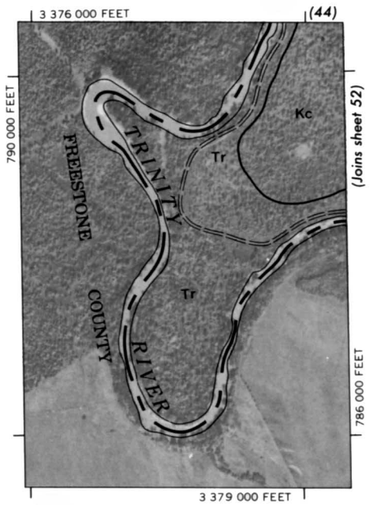
ANDERSON COUNTY, TEXAS NO. 58

ANDERSON COUNTY, TEXAS — SHEET NUMBER 59

ANDERSON COUNTY, TEXAS NO. 59

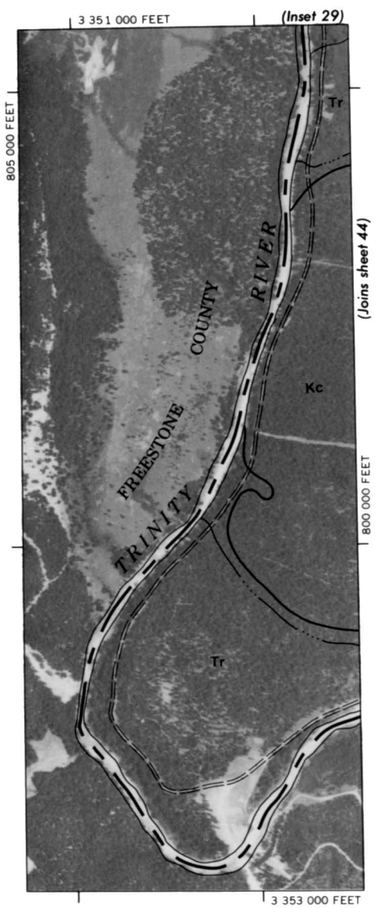
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

INSET A



3000 AND 4000-FOOT GRID TICKS

INSET B



2000 AND 5000-FOOT GRID TICKS

59

N

1 Mile
5 000 Feet
0
0
(Joins sheet 60)
Scale 1:20 000
¼
½
¾
1
1 000
2 000
3 000
4 000
5 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 60

60

N

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 1 000 2 000 3 000 4 000 5 000

¼ 0 ½ ¾ 1

3 425 000 FEET

775 000 FEET

760 000 FEET

3 410 000 FEET

(Joins sheet 53)

(Joins sheet 59)

(Joins sheet 61)

(Joins sheet 67)

Keechie Creek

Town Creek

TRINITY RIVER

FREESTONE COUNTY

TRINITY RIVER

FREESTONE CO

Tucker

Green Bay School

PACIFIC

MISSOURI

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 60

ANDERSON COUNTY, TEXAS NO. 61

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(Joins sheet 60)
(Joins sheet 54)
(Joins sheet 62)
(Joins sheet 68)

3 430 000 FEET
775 000 FEET
765 000 FEET
3 450 000 FEET

Town
Creek
Gum
Ebenezer Church
PACIFIC
MISSOURI
Mack

61

N

1 Mile
5 000 Feet
Scale 1:20 000
0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 62

62

N

(Joins sheet 55)

3 475 000 FEET

775 000 FEET

765 000 FEET

3 455 000 FEET

(Joins sheet 61)

(Joins sheet 63)

(Joins sheet 69)

1 Mile 5 000 Feet

Scale 1:20 000

0 0 ¼ 1 000 ½ 2 000 ¾ 4 000 1 5 000

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 62

ANDERSON COUNTY, TEXAS — SHEET NUMBER 63

ANDERSON COUNTY, TEXAS NO. 63

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 480 000 FEET

775 000 FEET

(Joins sheet 56)

(Joins sheet 62)

(Joins sheet 64)

(Joins sheet 70)

765 000 FEET

3 500 000 FEET

63

N

Scale 1:20 000

1 Mile

5 000 Feet

CHAMBERS CEMETERY

RUCKER CEMETERY

Madison Springs

Pine Hill Church

FERGUSON CEMETERY

Snake Creek

Frost Creek

2419

323

64

ANDERSON COUNTY, TEXAS — SHEET NUMBER 64

N

1 Mile

5 000 Feet

Scale 1:20 000

(Joins sheet 57)

(Joins sheet 63)

(Joins sheet 65)

(Joins sheet 71)

3 525 000 FEET

780 000 FEET

765 000 FEET

3 505 000 FEET

Alderbranch

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 64

ANDERSON COUNTY, TEXAS — SHEET NUMBER 65

ANDERSON COUNTY, TEXAS NO. 65

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 530 000 FEET

780 000 FEET

(Joins sheet 58)

(Joins sheet 64)

(Joins sheet 66)

(Joins sheet 72)

3 550 000 FEET

770 000 FEET

Kiff Creek

Gal Creek

Neches R.

CHEROKEE CO

65

N

Scale 1:20 000

1 Mile 0 1 000 5 000 Feet

¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 66

N

1 Mile 5 000 Feet

0 0

Scale 1:20 000

1 000

¼ 2 000

½ 3 000

¾ 4 000

1 5 000

(Joins inset)

(Joins sheet 65)

(Joins sheet 58)

(Joins sheet 73)

3 575 000 FEET

3 555 000 FEET

780 000 FEET

788 000 FEET

783 000 FEET

770 000 FEET

3 552 000 FEET

(Joins upper left)

3000 AND 5000-FOOT GRID TICKS

CHEROKEE CO

CHEROKEE COUNTY

ANDERSON COUNTY

NECHES RIVER

Neches River

Na Ro Th KuB TpC KnE DkF FuD FuB BoB DaD BoD LeC TmF SaC LuA

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 66

ANDERSON COUNTY, TEXAS NO. 67

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

N

1 Mile

5 000 Feet

0 0

Scale 1:20 000

¼ 1 000

2 000

½ 3 000

¾ 4 000

1 5 000

3 450 000 FEET

760 000 FEET

745 000 FEET

3 435 000 FEET

(Joins sheet 61)

(Joins sheet 67)

(Joins sheet 69)

(Joins sheet 75)

Lakeview Camp

Lakeview Camp Lake

Sulphur Springs Church

CEDAR CREEK CEMETERY

Crooked Creek

Cedar Creek

TRINITY RIVER

LEON COUNTY

1990

294

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 68

ANDERSON COUNTY, TEXAS — SHEET NUMBER 69

ANDERSON COUNTY, TEXAS NO. 69

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 455 000 FEET

760 000 FEET

(Joins sheet 62)

(Joins sheet 68)

(Joins sheet 70)

(Joins sheet 76)

750 000 FEET

3 475 000 FEET

Cronin

Cedar Creek Church

Manson Creek

Cedar Creek

Saddler Creek

Frost Creek

Parker Branch

Spring Branch

PACIFIC MISSOURI

69

N

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 70

70

N

(Joins sheet 63)

3 500 000 FEET

760 000 FEET

Scale 1:20 000

1 Mile

5 000 Feet

(Joins sheet 69)

(Joins sheet 71)

750 000 FEET

3 480 000 FEET

(Joins sheet 77)

Elkhart Lake

Days Chapel

Box Creek

Trotters Branch

Squirrel Creek

DeLaney Branch

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 70

ANDERSON COUNTY, TEXAS — SHEET NUMBER 71

3 505 000 FEET

760 000 FEET

(Joins sheet 64)

(Joins sheet 70)

(Joins sheet 72)

(Joins sheet 78)

3 525 000 FEET

750 000 FEET

71

N

Union Hope Church

CRAWFORD CEMETERY

St James Church

Slocum

Slocum School

Boggy Creek

Squirrel Creek

Alder Branch

Turkey Creek

1 Mile

5 000 Feet

Scale 1:20 000

ANDERSON COUNTY, TEXAS NO. 71

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

72

ANDERSON COUNTY, TEXAS — SHEET NUMBER 72

N

Scale 1:20 000

1 Mile 0 1/4 1/2 3/4 1

5 000 Feet 0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 65)

(Joins sheet 71)

(Joins sheet 73)

(Joins sheet 79)

3 550 000 FEET

765 000 FEET

750 000 FEET

3 530 000 FEET

Providence Church

Denson Springs Church

Creek

Squirrel Creek

Ioni Creek

Cedar Creek

323

294

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 72

(Joins sheet 66)

3 555 000 FEET

765 000 FEET

(Joins sheet 72)

(Joins sheet 80)

3 575 00 FEET

755 000 FEET

ANDERSON COUNTY, TEXAS NO. 73

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

73

N

1 Mile

5 000 Feet

Scale 1:20 000

1 000 0 0 1 000

¼ ½ ¾ 1

2 000 3 000 4 000 5 000

ANDERSON COUNTY, TEXAS — SHEET NUMBER 74

(Joins sheet 67)

74

N

Scale 1:20 000

1 Mile 5 000 Feet

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

3 430 000 FEET

740 000 FEET

730 000 FEET

3 410 000 FEET

FREESTONE COUNTY

LEON COUNTY

Salt Water Slough

Long Lake

McCrackin Lake

Brushy Lake

TRINITY RIVER

Kc

ArD

Tr

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 74

ANDERSON COUNTY, TEXAS — SHEET NUMBER 75

ANDERSON COUNTY, TEXAS NO. 75

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 435 000 FEET

740 000 FEET

730 000 FEET

3 455 000 FEET

(Joins sheet 68)

(Joins sheet 76)

(Joins sheet 82)

75

N

1 Mile

5 000 Feet

Scale 1:20 000

TRINITY

LEON COUNTY

LEON RIVER

Manson Creek

Cedar Creek

322

N

(Joins sheet 69)

3 475 000 FEET

745 000 FEET

730 000 FEET

3 460 000 FEET

(Joins sheet 83)

(Joins sheet 75)

(Joins sheet 77)

Scale 1:20 000

1 Mile 5 000 Feet

0 0

¼ 1 000

½ 2 000

¾ 4 000

1 5 000

Elkhart

Pilgrim Church

Manson Creek

Box Creek

Missouri Pacific

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 76

ANDERSON COUNTY, TEXAS — SHEET NUMBER 77

ANDERSON COUNTY, TEXAS NO. 77

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 480 000 FEET

745 000 FEET

(Joins sheet 70)

(Joins sheet 76)

(Joins sheet 78)

(Joins sheet 84)

735 000 FEET

3 505 000 FEET

77

N

Scale 1:20 000

1 Mile

5 000 Feet

Elkhart

Broom City

Box Creek

Squirrel Creek

Missouri Pacific

N

Scale 1:20 000

1 Mile 5 000 Feet

0 0 ¼ 1 000 ½ 2 000 ¾ 4 000 1 5 000

(Joins sheet 71)

(Joins sheet 77)

(Joins sheet 79)

(Joins sheet 85)

3 525 000 FEET

745 000 FEET

735 000 FEET

3 505 000 FEET

Slocum

STRONG MEMORIAL PARK

Ioni Creek

LAKE IONI

Saddler Creek

2022

294

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 78

ANDERSON COUNTY, TEXAS NO. 79

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(80)

N

Scale 1:20 000

1 Mile — 5 000 Feet

(Joins sheet 73)

(Joins sheet 79)

(Joins inset B, sheet 85)

3 575 000 FEET

750 000 FEET

735 000 FEET

3 355 000 FEET

CHEROKEE COUNTY

NECHES RIVER

HOUSTON COUNTY

Caney Creek

Maggie Branch

Miles Creek

Muse Church

294

228

ANDERSON COUNTY, TEXAS NO. 80

ANDERSON COUNTY, TEXAS — SHEET NUMBER 81

INSET A

3 425 000 FEET

(Joins lower right)

710 000 FEET

LEON COUNTY

TRINITY RIVER

Kc

Ka

Tr

(Joins sheet 86)

LEON CO.

HOUSTON CO.

695 000 FEET

3 430 000 FEET

3 420 000 FEET

725 000 FEET

INSET B

3 458 000 FEET

(Joins sheet 83)

Th

KnE

DaD

TkF

TkD

HOUSTON COUNTY

FuD

BoB

LaB

FuB

GaB

SmC

(Joins sheet 86)

705 000 FEET

3 463 000 FEET

715 000 FEET

LEON COUNTY

TRINITY RIVER

water

(Joins sheet 82)

(Joins inset A)

3 430 000 FEET

81

N

1 Mile

5 000 Feet

Scale 1:20 000

1¼ 2 000

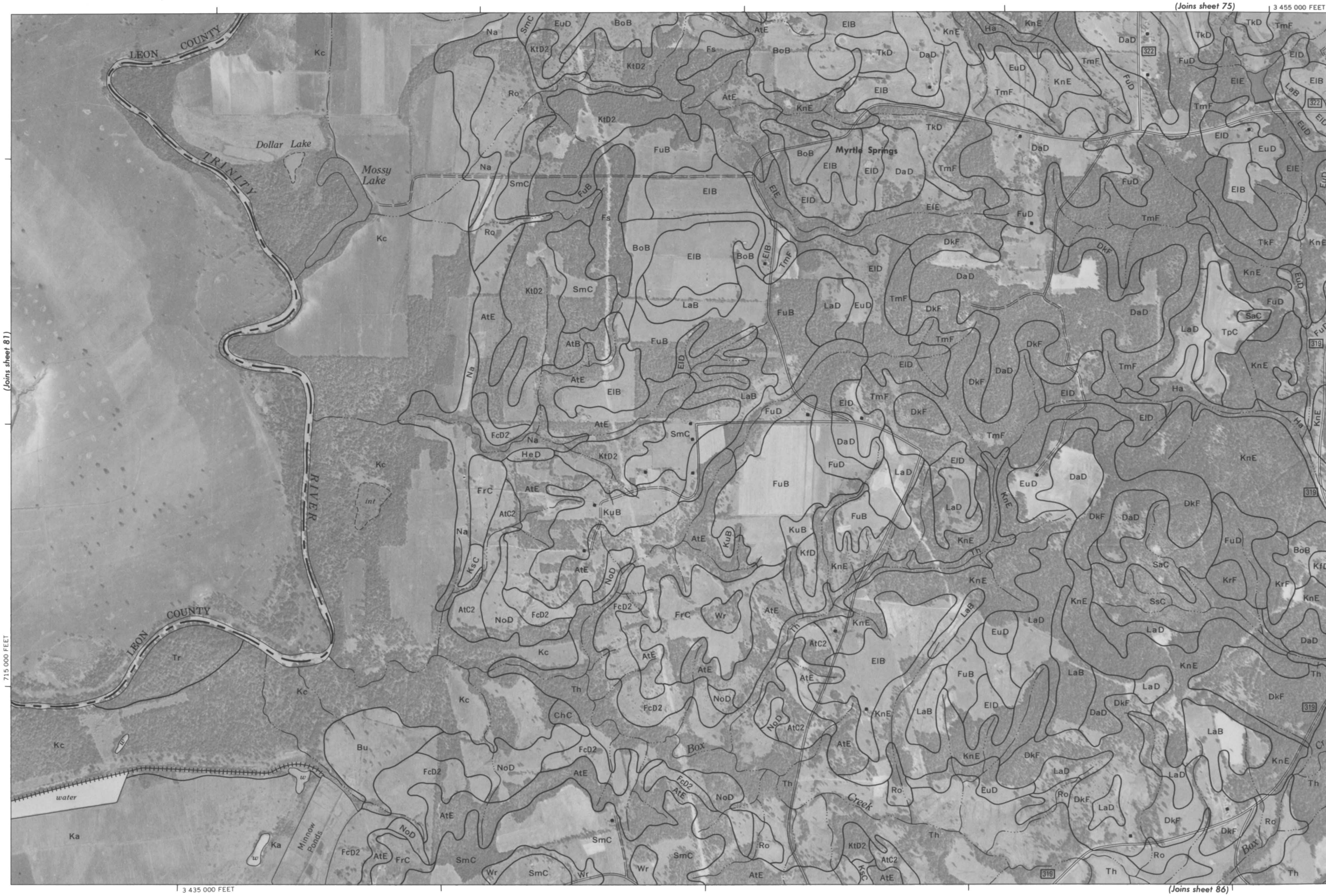
½ 3 000

¾ 4 000

1 5 000

ANDERSON COUNTY, TEXAS NO. 81

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.



Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS — SHEET NUMBER 83

ANDERSON COUNTY, TEXAS NO. 83

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 460 000 FEET

725 000 FEET

715 000 FEET

(Joins sheet 82)

(Joins sheet 76)

(Joins sheet 84)

(Joins inset B, sheet 81)

HOUSTON COUNTY

Box Creek

83

N

1 Mile

5 000 Feet

Scale 1:20 000

84

N

(Joins sheet 77)

(Joins sheet 83)

(Joins sheet 85)

3 505 000 FEET

730 000 FEET

715 000 FEET

3 485 000 FEET

Rocky Mound Church

Salmon

HOUSTON COUNTY

MISSOURI PACIFIC

1 Mile

5 000 Feet

Scale 1:20 000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 84

ANDERSON COUNTY, TEXAS — SHEET NUMBER 85

ANDERSON COUNTY, TEXAS NO. 85

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

3 505 000 FEET

730 000 FEET

(Joins sheet 84)

(Joins sheet 78)

HOUSTON COUNTY

3 530 000 FEET

INSET B

3 355 000 FEET

(Joins sheet 80)

(Joins inset A)

733 000

732 000

3 560 000 FEET

1000 AND 5000-FOOT GRID TICKS

INSET A

3 530 000 FEET

732 000 FEET

(Joins upper right)

(Joins sheet 79)

3 550 000 FEET

(Joins inset A)

(Joins inset B)

725 000 FEET

728 000 FEET

85

N

1 Mile

5 000 Feet

Scale 1:20 000

N

1 Mile
5 000 Feet
Scale 1:20 000
0 0
¼ 1 000
½ 2 000
¾ 3 000
1 4 000
5 000

(Joins sheet 82)

(Joins inset A, sheet 81)

(Joins inset B, sheet 81)

3 455 000 FEET

710 000 FEET

695 000 FEET

3 435 000 FEET

Minnow Ponds

Redtown

HOUSTON COUNTY

TRINITY R.

Boyd Cr.

319

Ka Kc Na WlB AtE FcD2 FrC SmC Wr HeD FrA AtB FuB LuA BeA AwA Fs NoD AtC2 EuD KtD2 GaB DoC ChC ArD KsC KnE KuB Th Ro DaD FuD BoB

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ANDERSON COUNTY, TEXAS NO. 86